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HUNTING THE AFRICAN BUFFALO
MAY WOODLANDS IN THE AMERICAN MUSEUM
WILD BIRD GUESTS
JOHN BURROUGHS - AUGUST WEISMANN

The American Museum of Natural History

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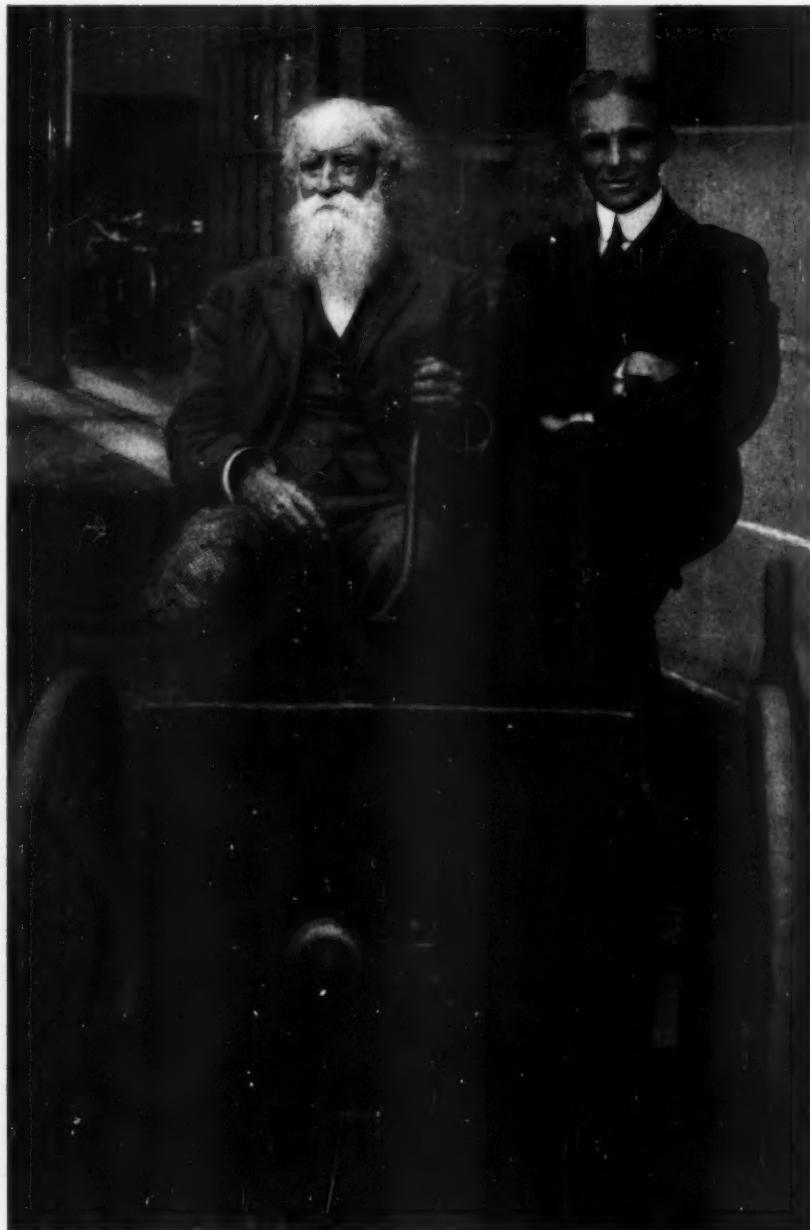
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MARY CYNTHIA DICKERSON, *Editor*

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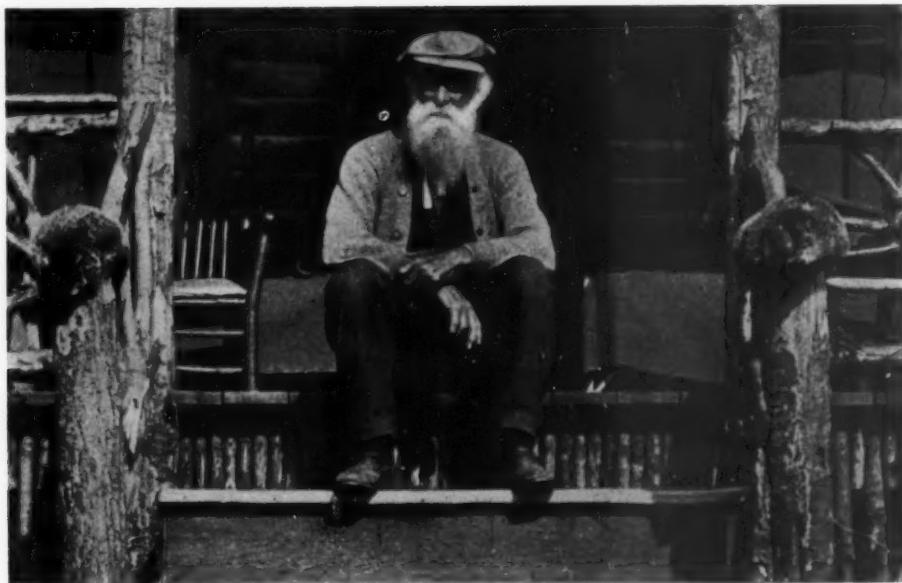
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JOHN BURROUGHS AND HENRY FORD

[In the first automobile designed and built by Mr. Ford.] The marble bust of Burroughs, recently shown at the exhibit by the National Academy of Design, has been presented to the Museum by Mr. Ford



Photos by A. H. Pratt

John Burroughs and his grandchildren by the well at Riverby. John Burroughs II has just been tossed to his shoulder

John Burroughs and the woodchucks at Woodchuck Lodge. The woodchuck is the only form of wild life on which Mr. Burroughs tries his skill with the rifle



Photo by A. H. Pratt

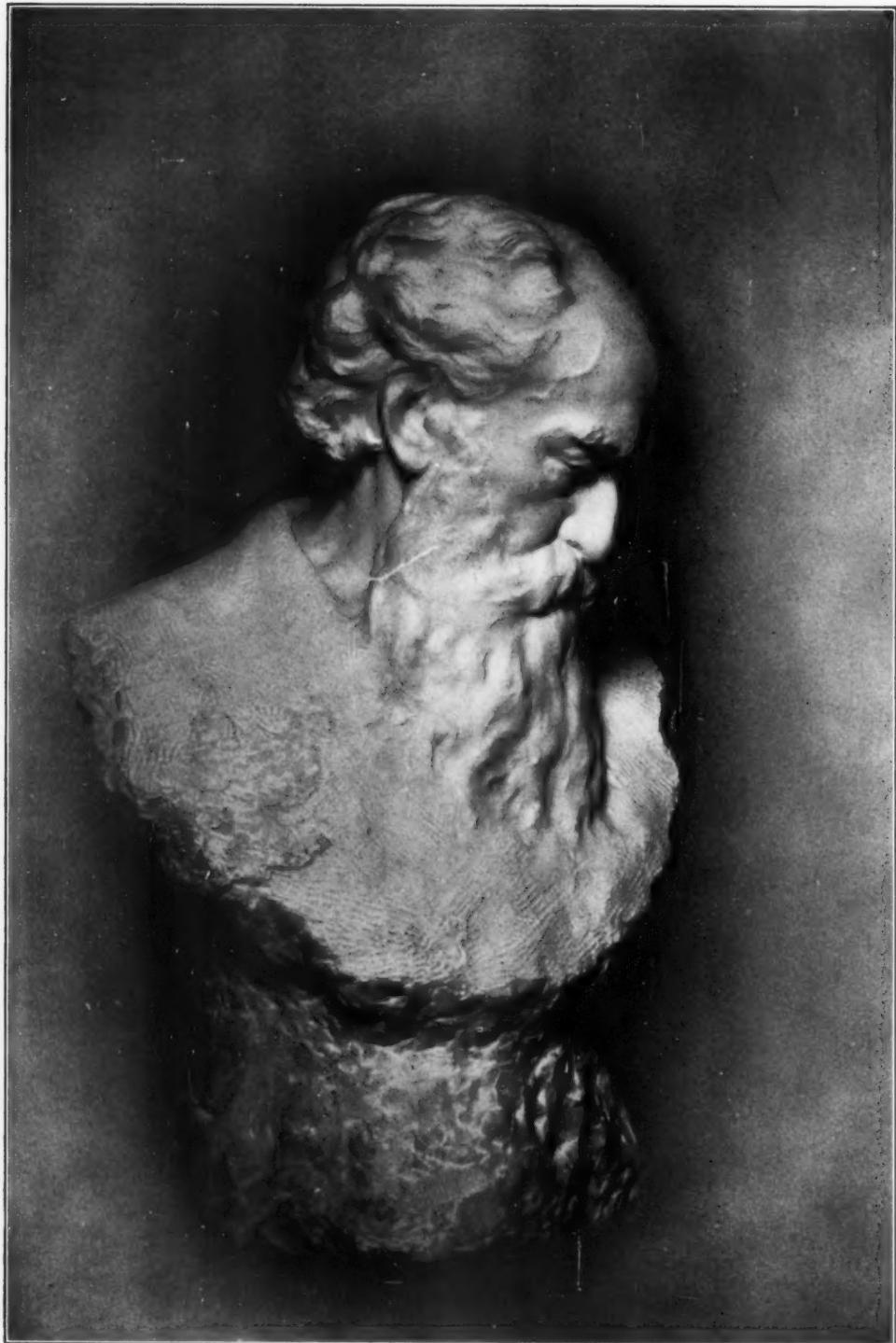
A NATURALIST AT HOME

John Burroughs looking up the Grand Gorge of the upper Pepacton, a stream closely associated with his boyhood and youth

Photo by A. H. Pratt

POSING FOR THE SCULPTOR

On the stone wall across the road from Woodchuck Lodge at Roxbury, New York, while the sculptor, C. S. Pietro, models a statuette. This was the first of the studies of Burroughs that finally resulted in the Museum bust.



JOHN BURROUGHS, NATURALIST

This bust of Burroughs by the sculptor C. S. Pietro together with a pedestal in marble to harmonize with the bust, has recently been presented to the Museum by Mr. Henry Ford

— "Note on John Burroughs," page 196

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HUNTING THE AFRICAN BUFFALO¹

ONE OF THE MOST DANGEROUS OF BIG-GAME ANIMALS IN BRITISH EAST AFRICA

By Carl E. Akeley

Illustrations from photographs by the Author

WHEN we first went to British East Africa in 1905, on interviewing the government officials at Mombasa, we learned that our game license would not include buffalo. Buffalo were thought to be nearly exterminated as a result of the rinderpest of the early nineties. There were known to be a few herds however, and finally in view of the fact that the buffalo killed were to be used for scientific purposes, the officials consented to let us have five on payment of a license fee of five pounds each. The arrangement allowed us to hunt at the edge of the reserve at Kijabi where a small herd lived in the bush and forest of the Rift Valley and the escarpment. We were warned that it was very dangerous hunting them there because of the rather dense cover; that they were pugnacious and generally disagreeable creatures to hunt under such conditions.

We arrived at Kijabi and the first afternoon out one of our party came up with a herd and killed a cow — the cow of the buffalo group of Chicago. This was a good beginning and we fully

expected to have little difficulty in getting the complete series. Nevertheless at the end of four weeks, having been on their trails nearly every day without securing another specimen, we gave up in despair.

These particular buffalo had been much hunted and had become wary. More than once while carefully tracking a single animal through the bush, we were startled by the sudden stampede of our quarry. The animal having decided to rest perhaps, had turned back to one side of the trail where he had heard us or got our wind. More frequently no doubt, the explanation lay in the eddying currents of air caused by the high and forested escarpment overhanging the low hot valley.

Later on during a month of collecting on the Mau Plateau at an altitude of from 7000 to 8000 feet, we spent some time hunting buffalo in the forests of that region but with no better success. We found only a couple of small herds and single animals, always in dense bush or forest.

Some six months later, when we had met with no further success on the plateau, we gained permission from the government to go across the Tana River into Mount Kenya Province, which up to that time had been a closed district. We were in camp at Nairobi preparing

¹ This story gives some idea of the danger and the hard work connected with shooting six African buffalo for the Field Museum, Chicago, in 1905. These specimens now form a group, recently mounted by Mr. Akeley in the elephant studio at the American Museum and shipped to Chicago for permanent installation there.—THE EDITOR.

AFRICAN BUFFALO IN FIELD MUSEUM, CHICAGO

A group recently mounted by Mr. Akeley for Field Museum, the work being done in the elephant studio at the American Museum of Natural History. The buffalo in the group are as follows, naming from the left: *young bull*, shot by Mr. Akeley at the edge of the great marsh or *tinge-inga* on the Tisba River; *large bull*, shot by Mrs. Akeley on the Tana River; *cow* shot at the edge of the reserve at Kiljabi; *calf* and *young herd bull* taken from a large herd on the Tana River. These are a half-dozen buffalo with great scientific value, a series illustrating the development from babyhood to old age.



for the journey when one morning a company of the King's African Rifles passed on the Fort Hall road, and we soon learned that trouble had broken out among the natives across the Tana and as a result our trip was postponed.

Some eight weeks later after an elephant hunt on the Abadare Mountains, we arrived at Fort Hall just as the Governor, Sir James Hayes-Saddler, with his suite was about to go across Mount Kenya Province for the purpose of locating the site of the new "Boma" in the newly pacified region. Not only was our permit to hunt in the district renewed but we were invited to accompany the official party as far as our routes paralleled. It had been the Governor's intention to go on a buffalo hunt, when the official work was finished, and it was suggested that we go elephant-hunting on Mount Kenya until the Governor had finished his shooting. To hunt elephant on Mount Kenya was an unexpected privilege; nothing could have pleased us more.

After six weeks we returned from the elephant hunt to the Tana River where we made a base camp, stored the elephant and other skins and proceeded two marches about twenty-five miles down the river. Here we established our "buffalo camp." Buffalo sign was abundant but for many days we came up with none except old outcast bulls, usually two or three together, no one of which seemed desirable specimens. We frequently saw indications of a herd but it was only after many days that we finally found them, and then just at the close of a day so that we were not able to pick out the individuals we wanted. Back to camp we went, ten miles in the dark, through a region that was literally rhino-infested, with the hope that on the following day we could make good with the buffalo. It turned out that we spent

a week looking for that herd and never again found it.

One morning however, Cunningham having gone out with some boys to shoot meat for camp, came upon three old buffalo. He sent a runner back to camp with the news and Mrs. Akeley and I started out to join him. Halfway from camp we were obliged to make a wide detour to avoid an old rhino and calf, but soon caught up with Cunningham. He reported however, that the buffalo had passed on into some dense bush. We started to follow, but suddenly came on to two rhinos. We quickly turned to the leeward not to disturb them by giving them our wind, thereby possibly bringing on a general stampede of the game in the neighborhood. This turn brought us to the windward of the old cow and calf that we had first avoided, with the result that she came charging up, followed by the calf close at her heels, snorting like a locomotive. Cunningham helped Mrs. Akeley up a convenient tree. He stood at the base of the tree and I at the foot of another where we poised with our guns ready, watching the old cow go tearing past within twenty feet of us. But the rhino had lost her scent and it was a typical "rhino charge" which means merely a general mad rush up and down in a stupid effort — perhaps to get away from the supposed danger.

We continued on the buffalo trail, but the stampede of the rhino had resulted in alarming the buffalo so that instead of finding them nearby, we were forced to follow them for an hour or more before again coming in sight of them; and again twice more they were stampeded by rhinos that happened to get in our path. At last the buffalo evidently became tired of being chased from place to place, and came to rest on a sloping hillside which we could approach only by crawl-

ing on our hands and knees in the grass for a considerable distance. In this manoeuvering it happened that Mrs. Akeley was able to stalk the best bull, and a few minutes later he had been finished off and we were busy photographing, measuring and preparing the skin. Twice during the operation of skinning we had to send our boys to chase off curious rhinos who acted as though they wanted to come in and break up the party. This bull became the big bull of the Chicago group.

Some twenty-five miles to the northwest from the Tana, across the plain on the Theba River, is a marsh, the *tinga-tinga* of the natives, where a herd of nearly a hundred buffalo was known to live, but the Provincial Commissioner had definitely said that we were not to shoot these. We decided finally to ask for the privilege, which was granted but with a warning in the form of an explanation, that he had told us not to shoot there because of the danger involved.

We found the *tinga-tinga* a reed marsh about one by two miles in extent with, at that time, a foot or two of water in the buffalo trails that crisscross in all directions. On arrival, while making camp at one end of the marsh just at dusk, we saw the herd come out on dry land a half-mile away — but they returned to cover before we could approach them. In fact during nearly two weeks that we spent there, we saw them come outside the swamp only twice, each time to return immediately.

We made several attempts to approach them in the marsh but found that while it was quite possible to get up to them, it was out of the question to choose our specimens. Also it would have been impossible to beat a retreat in case of a charge or stampede, so we adopted a campaign of watchful waiting. From the camp at daybreak we would scan the

marsh for the snowy cow herons that were always with the buffalo during the daytime. These would fly about above the reeds from one part of the herd to another and at times where the reeds were low they could be seen riding along perched on the backs of the animals. Having thus located the herd and determined the general direction of its movements, we would go to a point at the edge of the marsh where it seemed likely that the animals would come out, or at least come near enough to be visible in the shorter reeds. It was in this way that we secured the specimen that makes the young bull of the group — and two weeks spent at the *tinga-tinga* resulted in securing no other specimen. On this one occasion the buffalo accompanied by the white herons, had come to within about a hundred yards of our position on the shores of the swamp. They were in reeds that practically concealed them, but the young buffalo in question in the act of throwing up his head to dislodge a bird that had irritated him, disclosed a pair of horns that indicated a young bull of the type I wanted. At the same time a heron standing on his withers gave me the clue to his position and aiming some two feet below the bird, I succeeded in killing the bull with a heart shot.

Feeling that it was practically impossible to choose and collect the desired series from this herd, we determined to go back to the bush and plains between the Theba and Tana rivers in an effort to locate a herd that we had seen earlier on the Tana. Knowing that this herd must go daily to water either at the Tana or the Theba, which bounded the two sides of the triangular territory through which we were working, we decided to go down the Theba to its junction with the Tana, then up the Tana to our original buffalo camp. From the swamp down



Part of the expedition crossing the Tana River by the primitive government ferry (1906). At this point near Fort Hall, the government has since erected a pine bridge

Mr. Akeley established his main "buffalo camp" on the Tana River and it was near this camp that the big bull of the Chicago group was shot by Mrs. Akeley. During a second march up the Tana River some months later, the herd of five hundred buffalo was encountered [see photograph on page 159]



The King's African Rifles leaving Nairobi for a scene of trouble in Kenya Province



Family and home of the Wandorobo guide of the Mau Plateau

the Theba to its junction with the Tana occupied three days during which time we saw no fresh sign of buffalo. On the second march up the Tana, as I was traveling ahead of the safari at about midday, looking out through an opening in a strip of thorn bush that bordered the river, I saw in the distance a great black mass on the open plain which on further investigation with the field

glasses I was reasonably certain was a herd of buffalo. Sending a note back to Cunningham, who was in charge of the safari, suggesting that he make camp at a hill on the banks of the Tana some two miles ahead of my position and await me there, I started off over the plain with my two gun-boys. Coming up out of a dry stream-bed that I had used to conceal my approach to the herd

I came on to a large herd of eland, and my first fear was that I had mistaken eland for buffalo.

Going farther on the high land however, we saw a herd of about five hundred buffalo lying up in a few scattered thorn trees, some four or five hundred yards away. At first it seemed an almost impossible situation. There was practically no cover and no means of escape in case the herd detected us and saw fit to charge and at that time my respect for the buffalo led me to be extremely cautious. We worked around the herd trying to find some place where a safe approach might be made. Finally seeing a little band of a dozen buffalo off at one side on the bank of a ravine which offered splendid protection, we stalked

them but unfortunately not one in the band was desirable as a specimen. Since this was so, I tried them out, giving them my wind, then going up where they could see me better. I found that they were quite indifferent either to the scent or the sight of man. They finally moved off quietly without alarm. I then knew that this herd had had no experience of men or hunters, and that there was perhaps less to fear from them than from the traditional buffalo of the sportsman. So going back to the main herd, I crept up boldly to within a hundred yards of them. They saw me, faced about, closely inspecting me, but with no sign of alarm. It was approaching dusk and in this great black mass it was difficult to pick out a good pair of horns except with



Rhinos in buffalo country. Rhinos may be greatly in the way in buffalo-hunting. Sometimes as many as twenty or thirty were encountered in a single day

the aid of the glasses. I carefully located a fine bull and then shot as I supposed at the one I had located. As I fired, the animals bolted, first away, then back toward me. They wheeled, ran halfway between the dead animal and

ing up to the dead animal, I found much to my regret that I had shot a cow and not the bull I had picked out through the glasses.

I returned to camp feeling that now at last from this herd living apparently in the open, we should have relatively little difficulty in completing our series of specimens. On the following morning much to our disappointment, our first glimpse of the herd was just as it disappeared in the thorn bush along the banks of the river. We put in nearly a week of hard work to complete the series.

During those seven days of continual hunting, that herd which had been indifferent and unsuspecting at the beginning became cautious, vigilant and aggressive. For instance, on one occasion near the close of the week, after having spent the day trying to locate the herd, I suddenly came face to face with them just at the edge of the bush at night on my way back to camp. They were tearing along at a good pace, apparently having been alarmed. I stepped to one side and crouched in the low grass while they passed me at twenty-five or thirty yards in a cloud of dust. Even had I been able to pick out desirable specimens at this time I should have been afraid to shoot for fear of getting into difficulties when they had located my position. I turned and followed them rapidly as they sped away over the



One of our Wandorobo guides while hunting buffalo on the Mau plateau. The bow is protected by a sheath of raw hide wound spirally. This with a quiver of poisoned arrows, and a short sword are his weapons of offense and defense

myself and passing on some hundred yards to the right, wheeled about again and stood watching me, the bulls in the front lined up like soldiers, the calves and cows in the background. On com-

hard ground until the noise of their stampede suddenly stopped. I then decided that it was best to get to some point of vantage and await further developments. I climbed an acacia tree



Photograph made in 1910, not far from the place on the Tana River where I found the herd of five hundred, four years earlier. Probably a part of the original herd that had been split off.

that enabled me to look over the top of the bush. About fifty yards ahead I could see some fifty buffalo lined up in a little open patch looking back on their trail. As I was perched in the tree endeavoring to pick out a desirable animal, I suddenly discovered a lone old bull buffalo coming from the bush almost directly underneath me, sniffing and snuffing this way and that. Very slowly, very cautiously he passed around the tree, then back to the waiting herd, when they all resumed their stampede and made good their escape for the day.

One morning I came in sight of the herd just as it was entering the thorn bush and followed hurriedly on the trail, until just at the edge of the jungle I happened to catch sight of the two black hoofs of an old cow behind the low-hanging foliage. I stopped, expecting a charge. After a few moments I backed slowly away until I reached a tree where I stopped to wait developments. Stooping down I could see the buffalo's nose and black beady eyes as she stood motionless. The rest of the herd had gone on out of hearing and I think she was

quite alone in her proposed attack. After a few moments, apparently realizing that her plan had failed, she turned about and followed the herd, moving very quietly at first, then breaking into a gallop.

On the following day we came up again with the herd toward evening in the same region. As we first saw them they were too far away for us to choose and shoot with certainty. We managed to crawl to a fair-sized tree midway between us and the herd, and from the deep branches picked out the young herd bull of the group. When we had shot and he had disappeared into the bush, a calf accompanied by its mother gave us a fleeting glimpse of itself, with the result that we added the calf to our series.

The herd disappeared into the bush and after a few minutes we descended from our perch and inspected the calf, then started off in the direction the wounded bull had taken, and found him lying dead just a few yards away.

This completed the series much to our great joy, for by this time we were thoroughly tired of buffalo-hunting. It had

been a long hard hunt and our safari as well as ourselves were considerably the worse for wear. To shoot a half-dozen buffalo is a very simple matter and ought to be accomplished almost any day in British East Africa or Uganda, but to select a series of a half-dozen that will have the greatest possible scientific value by illustrating the development from babyhood to old age is quite a different matter. To the average sports-

ground of the region. Whereas the *tinga-tinga* buffalo have lived in the swamp for years and spend practically no time on hard ground, hence the hoofs are long, sharp and unworn as a result of walking always in the soft mud and water. All this in spite of the fact that these two herds may actually come in contact at the edge of the swamp. Other herds living in forest country, which come out into the grasslands to feed at



The young bull of the African buffalo group, with one of Mr. Akeley's gun-boys. The photograph shows the character of the marsh vegetation

man the one would be sport, the other hard labor.

These buffalo of the Tana country, that we found on the plains and in the bush, apparently rarely or never go into the swamps, a fact not only confirmed by observation but also indicated by the condition of the hoofs. These are horny, round and smooth as a result of traveling on the hard and more or less stony

night, always go back into the forest at daybreak.

In Uganda where buffalo are recognized as a menace to life and are of no particular value except for food, they are officially treated as vermin and one may shoot as many as he will. Here the herds have increased to an enormous extent and because of the dense jungles and general inaccessibility of the coun-

try, it is rather difficult to hunt them. While elephant-hunting in Uganda we found the buffalo a decided nuisance, frequently coming on to them unexpectedly while hot on an elephant trail, sometimes having difficulty in getting rid of them, not wishing to shoot or stampede them because of the danger of frightening away the elephants, to say nothing of the constant menace of running into a truculent old bull at very close quarters in dense jungle. The buffalo actually mingle with the elephants, each quite indifferent to the other, excepting that on one occasion we found elephant calves charging into a herd of buffalo, evidently only in play. They chased about squealing and stampeding the buffalo, who kept at a safe distance but did not actually take alarm. Occasionally an old cow whose calf was being hard-pressed by the young elephants would turn, apparently with the intention of having it out, but would always bolt before the elephant could actually reach her. In spite of the fact that the record head, fifty-four inches in spread, was shot by Mr. Knowles in Uganda, from our general observation, the heads in Uganda run smaller than those of British East Africa while the animals are perhaps heavier.

While on our buffalo-hunting we have never had any actually serious encounters, we fully appreciate that the buffalo deserves his reputation as one of the



Kikuyu porter with buffalo skull

most dangerous of big-game animals. His eyesight is good, he has keen scent and is vigilant and vindictive. While the lion is usually satisfied with giving his victim a knock-out blow or bite, the buffalo when once on the trail of man will not only persist in his efforts to find him but when he has once come up with him, will not leave while there is a vestige of life remaining in the victim. In some cases he will not leave while there is a fragment of the man remaining large enough to form a target for a buffalo's stamping hoofs.



A QUIET CORNER

Three Fowler's toads in the new "Toad Group" at the American Museum of Natural History

THE "TOAD GROUP" IN THE AMERICAN MUSEUM

A WORD AS TO ITS COMPOSITE CONSTRUCTION AND INTEREST

Group designed and construction directed by M. C. Dickerson; panoramic canvas by Hobart Nichols; detailed wax and color technique on the animals of the group by Frederick H. Stoll; group assembled by Ernest W. Smith and Frederick H. Stoll

By Mary Cynthia Dickerson

THE new group, fourth in the reptile and amphibian series, has been made with three important objects in view: first that it should set forth various facts in the ecology and general biology of amphibia; second that it should be more easily read than a book by those who wish to learn these facts; and third that it should be as beautiful as is the original spot lying under the sunshine of May in Rehoboth Township, Massachusetts. There should not be left out however even momentarily, a fourth aim which has controlled the work from first to last. This is that the group, while made up of the most delicate and fragile of constituent parts, should be permanent in construction, capable of lasting unchanged for decades, in fact indefinitely, if not destroyed by fire or earthquake.

In its scientific scope the group aims to set forth certain simple facts many of which are very well known to zoologists and laymen alike who wander much afield. These include such items as the difference in appearance and in time of breeding (in southern New England) of nine species of common amphibians,¹

and the identification for the ponds of northeastern North America of the amphibian eggs commonly seen. These latter include the eggs of frogs, represented in the group by the freshly laid eggs of the green frog and hatching eggs of the pickerel frog; those of salamanders, in the whole range of which there is more variation than among frogs, but among which the eggs commonly found are those shown in the group, the large gelatinous masses of the spotted salamander; and lastly those typical of toads, represented by eggs of Fowler's toad in the group, the long gelatinous strings in which the eggs are imbedded at intervals. The eggs in the group are accurate reproductions in glass treated with color and wax spray, and are the first attempt by museums to represent them as far as known.

Some of the unusual facts set forth, the results of original investigation in the field, concern such points as the distinction between the two species of toads and difference in their adaptation to low temperature as shown in their different

often confused with the larger bullfrog (*Rana catesbeiana*) (See bullfrog group), the spotted pickerel frog (*Rana palustris*) confused with the leopard frog (*Rana pipiens*) (See casts in synoptic case), and the little brown wood frog (*Rana sylvatica*) inured to the same low temperatures as are the ambystoma of the region and the peeper, thus appearing in March from its winter sleep in the mud; and finally two salamanders, the big black and yellow spotted salamander (*Ambystoma punctatum*) which is more often seen in damp places on land than in water, and the common small brown newt never seen out of water after it is one year old.

¹ The group includes specimens of two kinds of tree frogs, the tiny "spring peeper" (*Hyla pickeringii*) whose voice in chorus carries over the countryside a half mile or more in early spring, and the common so-called "tree toad" and "weather prophet" (*Hyla versicolor*); two species of toads, the American (*Bufo americanus*), breeding in the middle of April, and the smaller, grayer, more agile Fowler's toad (*Bufo fowleri*) coming to the pond from its hibernation the first week of May; three frogs, the green frog (*Rana clamitans*)



breeding times,¹ the swimming of the two-thirds grown tadpoles of the wood frog in definite schools as do fishes and the possible presence in the ooze at the bottom of the pond of a "nest" of adult amblystomas usually sought for on land only.

In working out the educational value there was a considerable problem. It was necessary to arrange the some one hundred animals of the group, besides the eggs and tadpoles, in a space a few feet square, with clearness for study. The final arrangement evolved, aims to make a quick appeal to the eye as to a distinct separation of different species, relationship of different stages of development of a given species, truthful position of all in the environment, and this with no sacrifice of scientific accuracy or of the actual probabilities and without crowding or arranging in synoptic form which would have killed the artistic effect.

Artistic effect in reptile and amphibian groups seems of particular importance, a thing to be striven for, for here we must overcome a large measure of more

or less active dislike for the subject. The completed group therefore has been made an illustration of the fact, but recently used in museum installation although now recognized as fundamental in all work of an educational character, that beauty is not incompatible with scientific value in an exhibit. On the other hand, it may strengthen the appeal of science.

The following quotation from a letter recently received from Mr. William Henry Fox, director of the Museum of the Brooklyn Institute of Arts and Sciences, touches the matter of art value in natural history exhibits:

My recent visit to the American Museum impressed me greatly with the artistic beauty of the reptile and amphibian groups. There is no reason why artistic effect as well as scientific truth should not always be taught in this way. I hold that without this essential, groups are of little educational value in a popular museum. The uninformed public must first be "taken into camp" as it were, with a visual impression which gives pleasure. I recognized at once in these groups conscious employment of the elements that the painter uses in making a picture on a flat canvas, such as composition, color harmony, the chromatic gamut and aërial perspective. He employs one medium; here is used another means to the common end — namely, the interpretation of natural phenomena. One of the secrets of the effect is that with all the animal and plant species, introduced with fidelity to natural effect and ecological order,

¹The plan of construction of the group includes a small pool of water at the left separate from the main pond and intended exclusively for the American toad with its tadpoles (while the specimens of Fowler's toad with freshly laid eggs are in the large pond at the right), so that there can be no possible confusion in the comparison of the two.





nothing has been permitted to obtrude into the picture. As in nature the infinitely varied manifestations of inanimate life and the creatures that abound in the water, on land and in the air are only details in the one universal conception of beauty.

From the artistic standpoint the construction of the toad group, it must be admitted, was also a problem: to create with artificial materials (wood and plaster, wax, glass, papier-mâché, celluloid and oil paints) an illusion so perfect that the observer will be actually deceived as to the realness of the objects; then to arrange these objects in a pleasing composition. There had to be careful handling of the colors, and especially of the lights, and the concrete foreground had to be blended with the panoramic painted background with proper perspective, in order to give illusion as to the naturalness of the scene as a whole.

The main difficulty lay in maintaining the balance, allowing nothing to take on ultra importance scientifically or pictorially, while still making the attitude or action of each of the animals the resultant of the demand of the location in the group (with consequent relations to neighboring animals) and the known habits of the species. It was at this point in the construction that decision was made to leave out or to subordinate

in position various large enemies of toads and frogs. The skunk for instance eats toads, first rolling them forcibly under his paws until the poison has been exuded from the skin glands. The muskrat varies his menu in spring by the addition of an occasional frog or toad, and hawks and owls as well as herons and even crows are known to include amphibia in their diet. I have seen a chipmunk hastening to his burrow with a woodfrog in his mouth and the red squirrel is very fond of meat in the spring after his winter on nuts and seeds. The only "enemies" of any size which found their way finally into the group are a red squirrel watching from the stone wall back of the apple tree, a water snake in the act of capturing a Fowler's toad but made inconspicuous by a projecting moss-covered root in the right front of the group, and a spotted turtle deep in the water at the rear and evidently the cause of the lively scurrying of the school of pollywogs.

It will thus be realized that in preserving the balance in the scientific, educational and art values of the group, the position of any animal is truly "strategic," and that its placing was not a simple matter and never a chance matter, but was determined by necessity in the fulfillment of the various demands.

A piece of original, complex, construc-



tive work is always a delight in the doing and the designer will always hope that what has been put into it will be taken out by one or another who stands before it. To create the new group has come as an opportunity to give back in a small measure here in the heart of New York City what was received some years ago from an intimate acquaintance with the New England "wilderness." Naturally no mere words can carry the news of the woods at any season with the vividness of the reality, even though that reality be set in a still picture. Words are weak indeed also to transmit the magnetic attraction nature exerts over man. They fail utterly to convey what will produce the personal reaction of feeling such as is wrought into one who lives out-of-doors and sees continually the most commonplace scene take on mean-

ing and beauty — perhaps under the influence of the mist of dawn, the quietness of dusk or the blackness of storm, perhaps when it is lashed by wind and rain, or afterward transfigured in a radiance of sunshine.

It is in this last mood that the recent group has been fashioned and in May, the season of new life, with the thought that perhaps this concrete picture would be able to do what words accomplish but inadequately. That in it there would be seen with unusual vividness and attractiveness the natural history facts involved, and that perhaps, in addition, there would be felt — by a child here, a lover of beauty there, the poet everywhere — some part of nature's subtle personal invitation and some reflection of the spiritual response which the original scene might invoke.



Restart and parula warblers.— May is the month of warblers and the gay-foliaged branches are filled with them, yet they are difficult to locate. (From the Toad Group)



DETAIL OF THE "TOAD GROUP"

The group emphasizes in its fine detailed technique the expert work in wax and glass of the Museum's artists



THE "TOAD GROUP" IN

A New England woodland scene created in permanent form in the American Museum. Everywhere are suggested joyous sound and movement and the exuberance of new life. Birds are just at the moment of flitting; toads and "tree toads" are calling



THE TIME OF MAY

A wild apple tree is in bloom over a tumble-down stone wall. The wild flowers — cowslips, columbines, jack-in-the-pulpits, anemones and trilliums — are so perfectly made that it is difficult to see that they are not real



A COVE WHERE GREEN FROGS LIVE
Detail from the Toad Group in the American Museum of Natural History

AQUARELLES OF OUR COMMON WOODLANDS¹

By Warren H. Miller

Editor of *Field and Stream*

OUR Museum has many wonderlands of American wild life upon which the hungry city dweller may feast his eyes, but none more beautiful than the collection of scenic cases presenting the amphibian life of the ponds and brooks of our familiar woodlands. It is a veritable fairyland that one enters here, a fairyland in more ways than one, for it is the gateway back to one's own forgotten youth, a fairyland having the power to touch the mystic chords of memory and reawaken the keen pleasures that one experienced, with the tenfold sensitiveness of youth, when going into the woods in the spring-time to collect wild flowers, to renew acquaintances with the birds, and to watch the still pools for signs of the activities of the small creatures which give the touch of life to such places.

I presume that these cases are given such prosaic names as the "toad group," and the "bullfrog group," but my soul will have none of it. To me the scene presenting the life of our common toads, is *May*; fresh, bounding May, the eternal New Year of the wilderness: when the new leaves have just unfolded, soft and feathery as fine plumes, the forest floor is carpeted with anemones, dog-tooth violets and jack-in-the-pulpits; and every dell has its wild bird finding melodious breath over the nodding sprays of Solomon's-seal. When I look upon that scenic picture of May in the woods I hardly see the wild life at all, at first. I see, dimly, a Boy of Ten, with

a net and an aquarium pail, and dimly recognize in him my own weatherbeaten and battle-scarred self. That boy is—somehow different. He is free, and bare-legged, and eager with the devouring eagerness of childhood; keen in his observation of every least detail of the pool beside which he is standing. It is a pool very like the one shown in the scenic case, every feature of the latter recalling similar scenes that were then of poignant interest to the Boy of Ten. Impelled by the hunter's ardor of pursuit and the scientist's eagerness to collect new specimens, the boy is gradually filling his pail with fish, tadpole, froglet and turtle, until after a morning's work he returns home triumphant and adds the spoil to the wild life already inhabiting his large aquarium. I suppose that nearly every boy who lives anywhere within reach of our ordinary woodlands has maintained an aquarium; certainly all the boys in our town did, and therein lies the appeal of the "May" scene to many observers of the male persuasion. To the feminine minds also come memories: of girlhood days in the Maytime woods collecting wild flowers, memories coupled probably with amazement that the abundant pond life of these same woods had been utterly overlooked during the careless days of youth.

Of course in these groups, the wild life of many pools must be concentrated into one, perhaps far beyond the capacity of the normal insect supply to support life. The boy who spent his morning collecting for his aquarium had, I am sure, to visit many such pools to secure even part of the complete series shown here—but there were no doubt many creatures

¹ Photographs for this article and the preceding as well as for the four-page sepia insert, made from the Toad Group by Mr. Julius Kirschner, Museum photographer



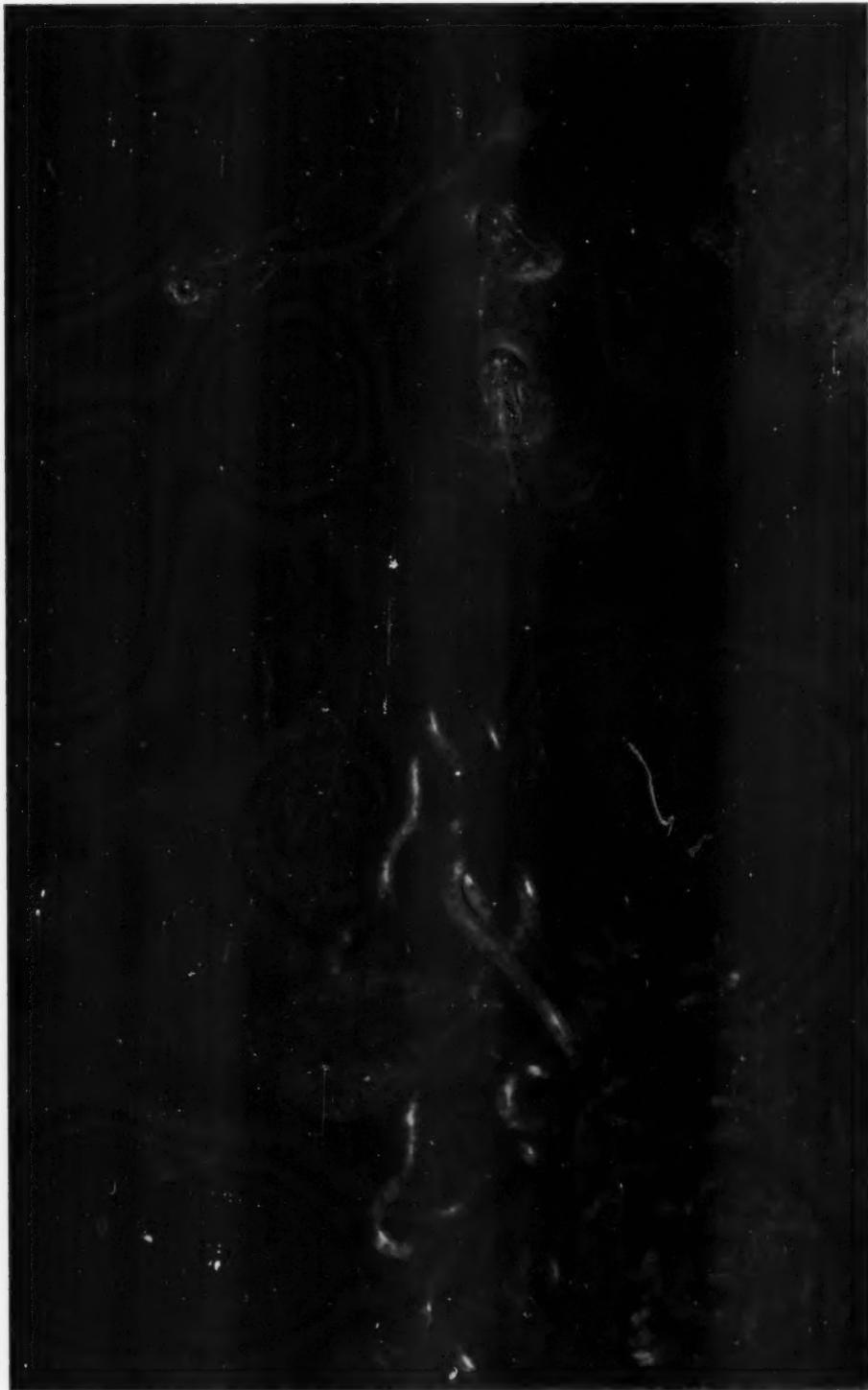
that he did not see in hiding in each pool, while here in the group all are brought out into plain view. Moreover, while your memory may tell you that you have seen just such a pool many times in the woods, as a matter of fact you have seen no such pool, for Nature, in her grand, haphazard way, has no place for Art in her small canvases; she shows a detail here and a detail there, but to assemble a complete scene that will lead the eye hither and yon according to the prearranged purposes of the artist, requires a skillful staging of the scene, using only legitimate natural "properties," and this Miss Dickerson has most ably done for us.

Describing the groups more in detail, the May scene, representing specifically the life histories of our various species of toads, frogs and tree frogs, assembles all of them under the banner of early spring. A stray wild apple tree on the right, with its abundant pink-and-white blooms; a tall blueberry in full blossom; various familiar vines and shrubs just coming into leaf; young hornbeam saplings, and a couple of sturdy oaks and red maples, proclaim a water scene in mid-May, and set the stage for the amphibian life that we can expect to see at that time. The eye further notes cowslips, violets, trilliums, jacks, dog-tooths and anemones as the plants in blossom, while the curls of unfurling ferns tell us yet again that spring is here. The hylas or "tree-toads" are out in force; everywhere in the natural places for them one espies them out, while attached to crimson spikes of water-plant down in the still, clear depths of the pool are their clusters of pearl-like eggs, for this is their breeding season. Various kinds of frogs and toads occupy important positions on the right and on the left of the case; down in the water are the egg masses just laid, and hatching

egg masses with tiny tadpoles pendant from the original matrix, and other tadpoles just detached are to be noted clinging to leaves and sticks. Over on the mossy promontory under the jacks are wood frogs just coming out of the water, while in the pool near them are their young tadpoles in a school, proving their communal instinct as they swim hastily away from the approach of a spotted turtle.

We not only see these hylas and toads and frogs as we stand before the ease but in memory we hear them too, the blending of melodious trill and bawling call of one and another. They make the springtime vocal. How it is done is suggested for some of the species in the group — that little sac under the chin is blown up by Mr. Lovelorn until full of wind, like Shakespeare's "lover, sighing like a furnace," and, without opening the mouth, the penetrating notes issue forth, made by the vocal chords in the throat and reënforced by this vocal sac. I recall an experiment made by the Boy of Ten to settle a dispute as to whether the hyla or the toad made a certain bawling sound — a sound which comes to me faintly now as I remember and listen. It was on a still night, encamped by a mountain lake, when incessant amphibian calls of one kind or another made the principal night sounds. The boy crept far out onto a great rock, jutting into the lake. All about in the darkness had been the calls. Silence instantly ensued with his coming, but after a five minute's wait, the calls began again. Softly lighting a candle, no fewer than six toads were discovered within the distance of a few feet. Presently one of the toads distended his throat pouch and issued his song. Followed him another, and another — and the dispute was settled for good.





TOADS AT THE POND IN MAY

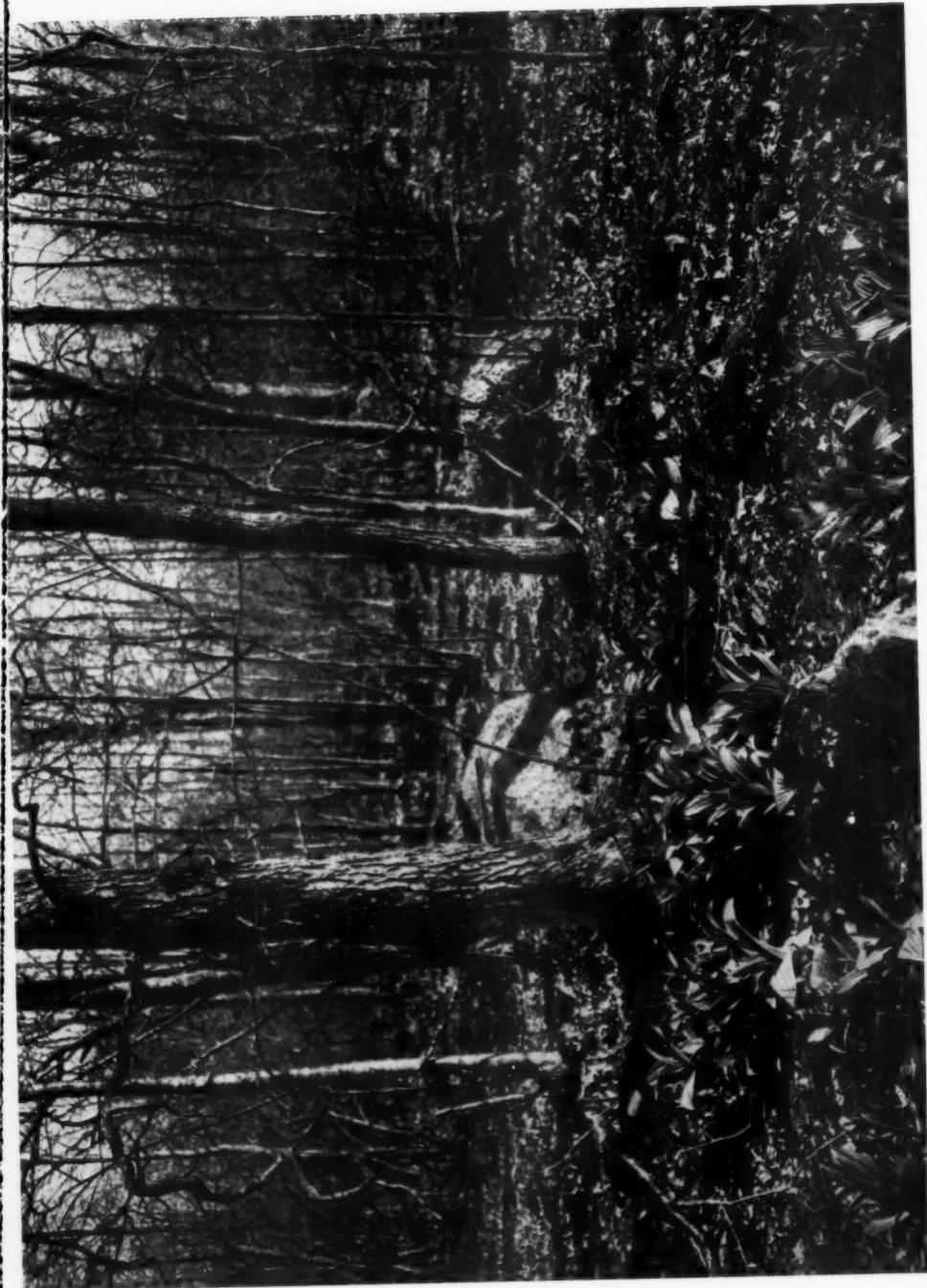
Four Fowler's toads (in the Toad Group at the American Museum), one swimming, a second just coming up from deep water, and two singing with throat resonating sacs expanded. Fowler's toads resort to the pond about the first of May (in southern New England, some two weeks earlier in New York). The small black eggs enclosed in gelatinous strings are to be seen in the lower part of the photograph

Some of the enemies of toad life are also shown in this group; two ribbon snakes on the left are ready to take toll of the small "spring peepers" which are whistling their high-pitched tones with throat bubbles well expanded, while a big water snake on the right has engulfed one of the toads. Finally the bird life of this time is not omitted for we note in trees and bush many of the warblers, the small flitting birds so typical of May: black and white creeper, Maryland yellowthroat, Blackburnian warbler, redstart and chestnut-sided and yellow warblers — these and others are here for the sharp eye to see.

The scenic case of next appeal to me is the one I call the June case — I suppose it bears the more practical designation of the "bulldog group" in museum parlance. But to me it is June, late June, no less! A deep, sunny pool in the hot sunshine of mid-day is this. We guessed that the time-o'-day of the May scene was morning, from the dew-drops twinkling on leaf and flower, but here all these have evaporated, and it is high noon in warm mid-summer. The scenic group shows the life of one of our most common frogs in our common lily-padded pools; a scene so familiar to all that its appeal stirs the heart of every one of us. Who has not stood contemplating such a pool; with these clumps of blue-spiked pickerel weed ranging away into the cool backwaters under the shade of giant forest trees, these small turtles scrambling awkwardly up over the flat lily pads in the foreground, that bulldog diving into the deep water and leaving on the surface a string of bubbles as he expels the air from his lungs; those newts poking their way along the bottom! Every detail of the scene is familiar, and no detail precious to memory has been omitted. There is our old comrade, the water turtle, just diving off a stump

(as we generally see him!) while the "bullies" are everywhere and all doing something that illustrates one or another of their life habits. Here is one that has just snatched up a mouthful of young water snakes, a whole squirming mass of them, which he is cramming into his mouth with a very human-like hand. Here is another, looking up expectantly at a wood mouse in a bush, for the bulldog is omnivorous and will eat anything that he can catch and then swallow down his capacious throat. Here is another that has just snatched in a bumble-bee off a wild white azalea (in full blossom so that we *know* that it is late June or early July), and the way he does it with his extensible tongue is well set forth. At this time of the year, too, frogs peel off the old skin, as shown by that fellow on the right who is just disrobing, and eating the old skin — frugal Frenchman — that nothing be lost! Bulldog tadpoles are here, too. It takes about two years to get up to frogdom from tadpolehood, and the whole process, including losing one's tail and living just above the water on a tiny snag, is shown here. Here also are some of the enemies of the "buldie." A black snake lurks behind that azalea and his sinister intentions are only too evident. One large bulldog who has seen him is "playing stone," knowing well that the snake's eyesight for inanimate objects is not over-keen. He has gathered himself into a smooth round wuzzle of green, and the snake sees him not. The latter is so intent on a young bulldog, which in his turn is so intent upon a chickadee just alighted on a birch branch above him, that a double tragedy seems imminent.

To the left of this scene is the September case, so-called the "giant salamander group." It is a big trout stream with yellow-leaved sycamore and ripening frost grapes hanging over, and blue asters

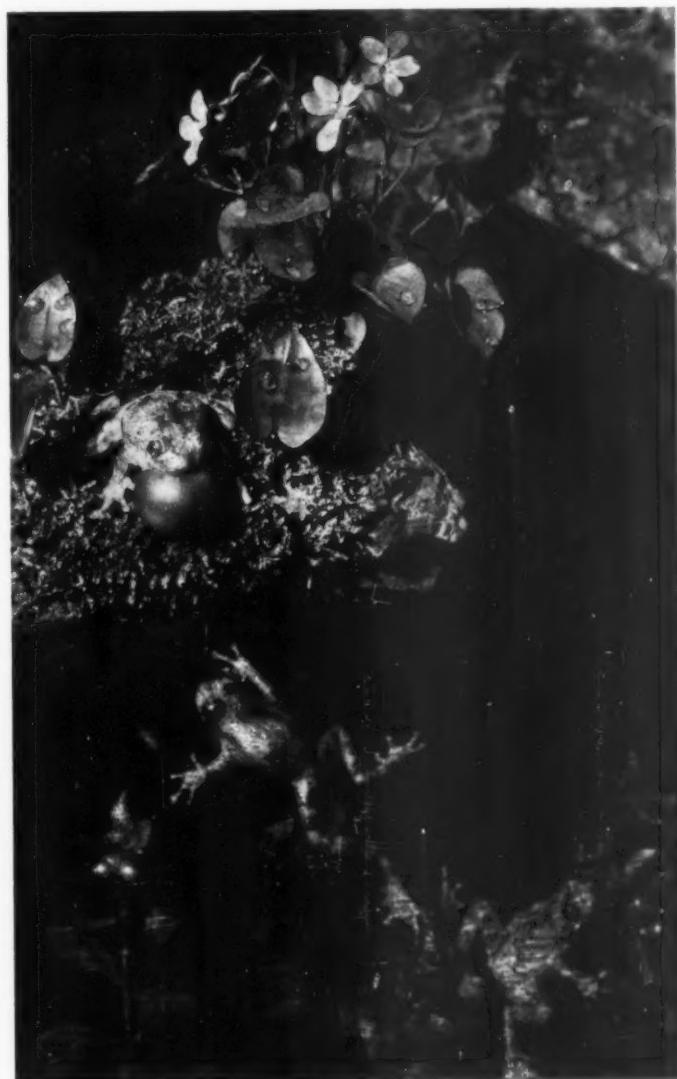


IN THE WOODLANDS BEYOND THE TOAD POND

Rehoboth Township, Massachusetts

bending low to the water. A kingfisher sits above, and the water flows toward you over many a rocky riffle, streaming the long fronds of brookweed in the current; flowing, flowing endlessly — right into your lap seemingly, a wonderful example of arrested motion by the artistry of the Museum preparators who will have Nature presented to us just as she appears in reality. Even the very stones of the brook bottom have that brown, velvety look that comes of settled sediment, and that peculiar slippery covering that brings many a trout fisherman to grief! Herein are depicted the life history and habits of the giant salamander, familiar to those who wade the mountain streams. A greedy voracious beast and a cannibal, with clumsy ways. Here is one that has seized a fish of the school which is swimming upstream, for in spite of his clumsy body, the salamander's protective coloration, blending exactly with the rocks of the brook bed, enables him to lie in wait until a brook fish hovers over

him — when he is quick to strike, and his mouth opens the full extent of the width of his head. Here are two big fellows fighting over a string of eggs. The one on guard over the eggs was lying among them under the rock watching, when along came a second salamander and started to bolt the eggs, whereat



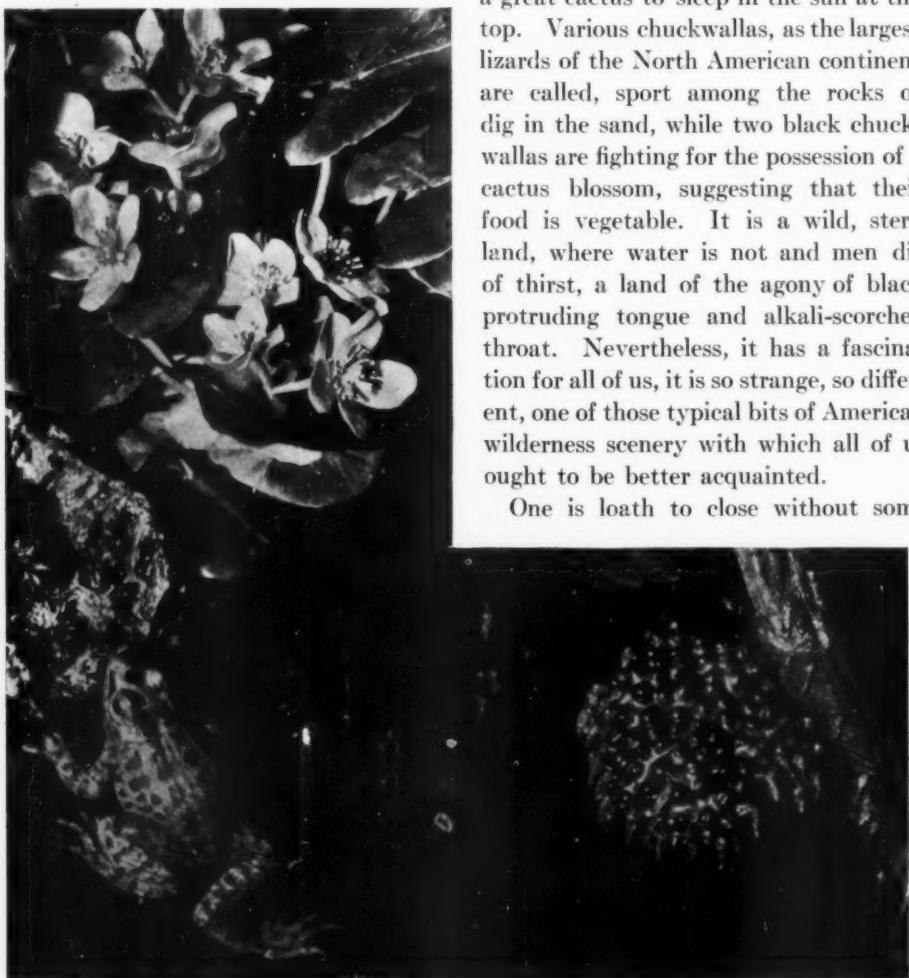
About a moss and violet covered root in the water (from the toad group). The common "tree toad" or so-called "weather prophet" (*Hyla versicolor*) is in the pond but a short time and then resorts to the orchard, the garden or edge of the woods. Notice the small clusters of this hyla's pearl-like eggs on the water plants

he has been seized amidships by the angry guard, although how well he is to be finally punished for his misdeed the scene does not tell us. Young salamanders are to be seen foraging along the bottom, and the red, land form of the newt is out on the bank of the river to serve as a standard of size for comparison with the giant species.

Another group, which I have never had the good fortune to observe in the natural state, is that showing some of the rep-

tilian life of the desert. Looking seaward on an island in the Gulf of California, appears to be this scene, the red volcanic rock, the cactus life, saguaro, ocotillo and palo-verde, being prominent in the stage setting. Under a volcanic fissure is the lair of a great rattler of the desert, he is just raising his head from his coils to look over the possibilities of prey outside. Small highly colored desert lizards are there for the catching, and an iguana is climbing up over the spines of a great cactus to sleep in the sun at the top. Various chuckwallas, as the largest lizards of the North American continent are called, sport among the rocks or dig in the sand, while two black chuckwallas are fighting for the possession of a cactus blossom, suggesting that their food is vegetable. It is a wild, stern land, where water is not and men die of thirst, a land of the agony of black protruding tongue and alkali-scorched throat. Nevertheless, it has a fascination for all of us, it is so strange, so different, one of those typical bits of American wilderness scenery with which all of us ought to be better acquainted.

One is loath to close without some



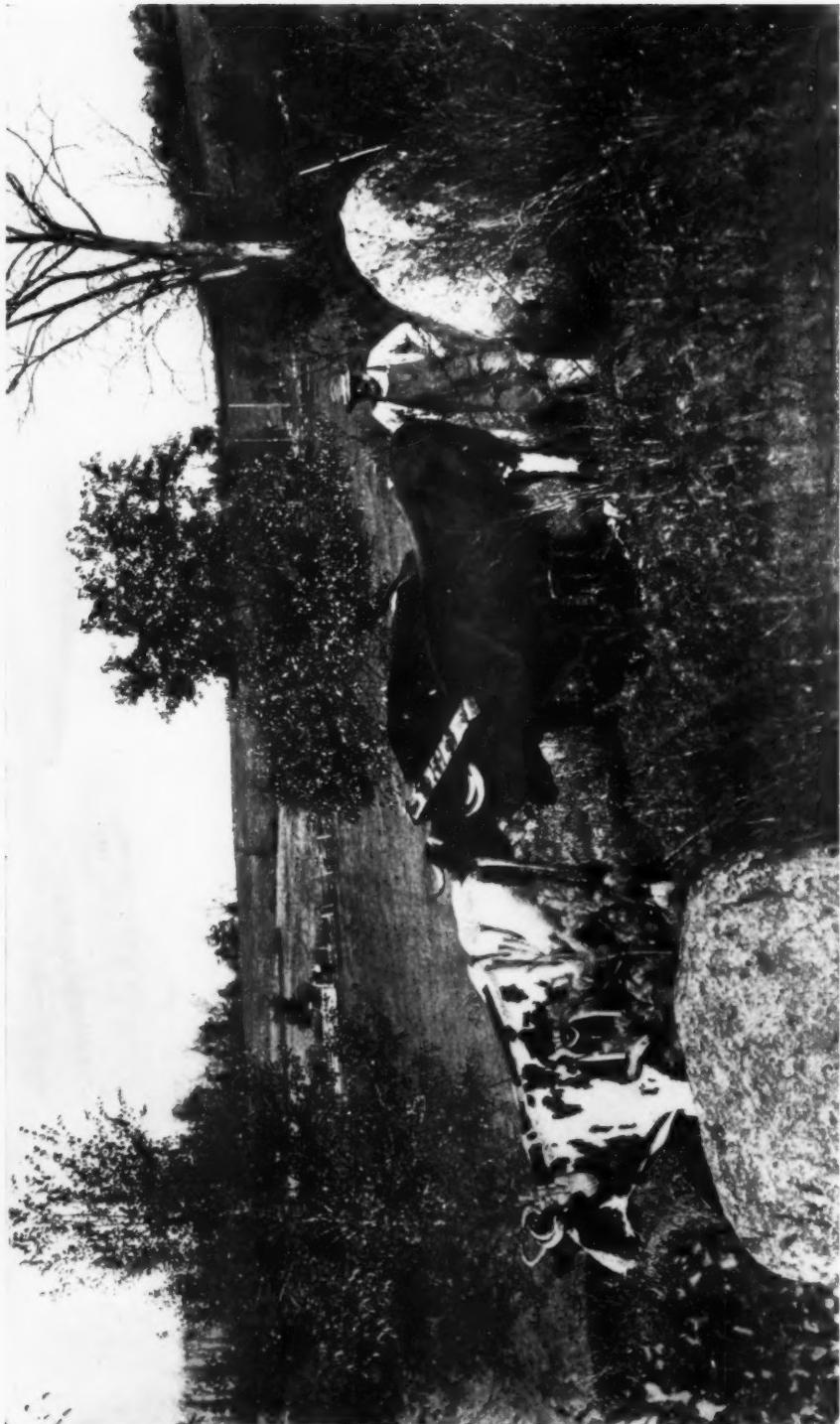
The pickerel frog (*Rana palustris*), with head above the surface of the pond (photograph from the Toad Group), and old egg mass and hatching tadpoles. The portion of decayed stump and sphagnum moss beside it (at the left) are real, the frog, tadpoles and marsh marigolds are wax, the egg mass is blown glass

word as to the inspiration these groups¹ give to go out and see for oneself these scenes put forth so powerfully. The appeal to children is strong; they are the nature lovers of the future, in whom the love of wild life imparted by the great story of the Museum cases will bear fruit in better protection of what wild spots we still have left. We know nothing about immortality, but this we know, that in our children we *do* live, and in them there will be carried forward what character the world once knew as ourselves. The Boy of Ten stands in the flesh before me, myself, yet also so different, my own son, just turned ten years. How do these scenes strike him? Well—there is little that those bright blue eyes overlook; not a tiny detail that passes unnoticed. He is living in the midst of the thing, not viewing it from a distance as we older ones must. Every scrap of pond life refers at once to his own aquarium: here's where you look for this particular kind of tadpole—he did n't know that there were several varieties of tadpoles before; that back-water is the place where those newts grow; never knew before that those peculiar greenish warty bulbs were a frog's egg mass, thought all eggs were in strings like toad's eggs—Oh, these cases were a mine of practical information to him, and we look for a large increase in the population of the aquarium this spring! And, what of that other child, not so

fortunate as to have his mind directed from infancy to the world of the great out-of-doors and with no large country-side to roam over, the city waif who comes in here to look—and wonder? Who can tell but that many such receive their first call to go back to the land, here; to forsake the crowded slum where body nor soul has a chance, and to earn their bread in *their* future close to the green soil, with just such a pond right over the dip of the hill!

And what of the older ones, we whose pathways in life are fixed, and may not be changed because here in the city we earn the bread that those dependent upon us must eat? What of the appeal to us? Here is Nature, spread before us; Nature in her most charming mood, with her silver filaments of still waters, her teeming abundance of humble (but not really familiar) pond life. And Nature can be found within an hour's train or trolley ride of the city. Shall we presume that, to the thousands who look upon these scenes there comes no desire to look again at the forgotten brookside? To discover for themselves many things besides flowers and birds, things that were before passed over unheeded, not knowing what to look for, nor realizing what a wealth of interest lay here untouched? Shall we not rather rest assured that thousands have here had reborn in them an inspiration to revisit old scenes, and a resolve not yet to let the home country-side relapse into the limbo of forgotten memories, not yet to let one's love of Nature be deep-buried in the dust of the city's turmoil.

¹ Photographs of the reptile and amphibian groups of the American Museum, other than the Toad Group will be found in previous issues of the JOURNAL as follows: Bullfrog Group, October, 1911; Giant Salamander Group, December, 1912; Lower California Lizard Group, February, 1914.



HAULING A GRANITE BOULDER FOR A BIRD BATH

If we wish to bring the wild birds near us, we must remember that in hot weather and especially in time of drought, there is nothing more attractive to them than cool shallow water in which to bathe

BIRD BATHS AND DRINKING POOLS¹

By Ernest Harold Baynes

In hot weather, especially in time of drought, there is nothing more attractive to birds than water. They need it to drink and to bathe in, and when the natural pools and streams are dried up, they will come from far and near to visit a properly constructed bird bath. At the very time this chapter is being written the weather is very hot and dry and birds are coming to the artificial baths in this village, Meriden, New Hampshire, not one at a time, but by scores. Only this morning they gathered at a little cement bath just outside my study window, and gave it the appearance of an avian Manhattan Beach. I saw two bluebirds, a chewink, a white-throated sparrow, a song sparrow, a junco, a chipping sparrow and a myrtle warbler, all bathing at once and at least a score of other birds were hopping about in the grass or perched in the bushes nearby, awaiting their turn. There are similar scenes at nearly all the bird baths in Meriden.

One example will suffice. In the Bird Sanctuary there is a bath made from a granite boulder, or rather half a boulder, for it was split in two, ages ago, probably by the frost. It broke in such a way that one half had a gently-sloping concave surface and we took this half, turned the concave surface uppermost that when filled with water it might form a natural pool for the birds. It was set upon a well-made stone foundation, and a hole was drilled down through to admit a lead pipe which supplies running water. As I approached this bath one evening after

sundown, I saw the whole surface of the water dancing as though a shoal of little fish were sporting in it, and spray was flying in every direction. It was simply a flock of birds taking their evening bath. Perhaps because night was coming on they were too impatient to wait their turn, for all seemed to be trying to get in at once, and most of them were successful. Juncos seemed to be most numerous, but there were several bluebirds and myrtle warblers and some sparrows which in their wet plumage and in the uncertain light I could not identify. A little apart a phoebe sat on a twig above the pool, watching for chances to dip down into the water for an instant, after which she would return to the twig to preen her feathers. Birds come to our bird baths every day in summer and fall, in an almost continuous procession, but usually just a few are present at the same moment. They come in large flocks only at exceptional times, usually during severe drought.

Bird baths may be as simple or as elaborate as one likes. A rough earthenware saucer from six inches to twelve inches in diameter and with half an inch of fresh water in it, is a great deal better than nothing and may attract some of the most delightful birds. I have seen robins, catbirds, Baltimore orioles and rose-breasted grosbeaks and many others bathe in an earthenware saucer. But the supplying of water is so very important that most of us will wish to do rather more than put out a saucer. Even from a selfish standpoint it is well to give birds all the water they want. If we do, they will be much less likely to destroy our small fruits which they sometimes eat chiefly for the fluid contained.

¹ This article is from Mr. Baynes's forthcoming book, *Wild Bird Guests and How to Entertain Them*. E. P. Dutton and Company, New York.

In making any bird baths, the first thing to look out for is the depth of the water. Few of the birds which will come to bathe will use water of greater depth than two and a half inches, and even for blue jays and grackles five inches is about the limit. But most birds will not jump off into any such depth, so if we had a pool with a uniform depth of two and a half inches, birds

popular with the birds, is made on the principle of a flight of broad steps, each one of which is two feet long and seven inches wide. There are five of these steps, each one-half inch lower than the last, so that when the water is half an inch deep on the top step, it is two and a half inches deep on the bottom one. The birds invariably enter the water at the top step. Their favorite steps are



Birds will come from far and near to visit a properly constructed bird bath. Mr. Baynes has seen in a simple little cement pool like this of the photograph seven species of birds at one time: bluebirds, a chewink, a white-throated sparrow, a song sparrow, a junco, a chipping sparrow and a myrtle warbler — and at least a dozen other birds awaiting their turn nearby

would come and drink, but few if any would bathe. So we must arrange for shallow places where the birds can enter the water; they will go in deeper presently, but they are very cautious. Half an inch is a good depth for the shallows and if the depth grades off to nothing at all, so much the better. A bath which the writer invented some time ago and which has proved very

the second and third; they seldom go lower than that. The bottom is covered with clean sand and bright pebbles from a trout brook, and here and there among them are strewn beautifully tinted shells.

Close beside the bath is a wooden tray of earth, on which are scattered every morning, birdseed of several kinds, bits of bread, a little suet, ripe raspberries

and a piece of banana perhaps, as additional attractions for the feathered guests. The smallest visitors are the chipping sparrows, gentle, modest little fellows, that come to the food tray quietly as mice, crack a few seeds, and then take a bath on the top step where the water is shallow. Almost burly in comparison, are the purple finches, which come, often two or three at a time, make a full meal in the food tray, and then souse themselves thoroughly in the deeper water, regardless of theories concerning the dangers of bathing too soon after dinner.

Perhaps the most amusing visitor is a catbird, which has a nest in the lilac bush, from whose top, in the early morning, he sings his wonderful song so surprising to those who know him by his cat-call only. He comes boldly to the food tray, hops lightly about, jauntily flirting his long tail, swallows a ripe raspberry, takes a bite or two of banana, and then proceeds to inspect the bath as if he had never seen it before. He cocks his head first on one side and then on the other, hops into the shallow water and begins to peek at the shells and pebbles at the bottom. Perhaps he will take one in his bill and hold it for a moment before dropping it back. Then he goes out into deeper water, and with wings vibrating as though operated by an electric current, takes a thorough bath "all over." When he comes out, he is a sorry-looking object, dripping wet and with tail-feathers stuck together. But apparently he cares nothing for appearances, and proceeds with his toilet forthwith. He shakes himself vigorously, flips his tail from side to side to get rid of the bulk of the water, and then it is surprising how soon, with the aid of his deft bill and a warm sun, he makes himself into a clean fluffy catbird again.

Sometimes, toward evening a blue-

bird visits the bath, and after washing himself in a very business-like way, flies off to a dead tree to preen and dry his feathers. Occasionally a phœbe comes, but apparently takes a bath more from a sense of duty than from any love of bathing. He seems to dislike cold water about as much as does the average small boy, for instead of getting right into it as most birds do, he flits through it, barely getting his feet wet. Perhaps this habit has been acquired by repeatedly darting after insects, and possibly is common to all flycatchers; at any rate I have seen a kingbird bathe by dashing through the water of a stream time and again, returning after each dip to a snag, from which he made a fresh dive after stopping a moment to preen his feathers—and perhaps to catch his breath.

The song sparrows are perhaps the most numerous visitors to this bird bath; they come earlier and stay later than any of the other birds. They act as if they owned this particular sheet of water, three feet by two, and if any other bird ventures too near while a song sparrow is bathing, the former is promptly driven away. These sparrows seem to love the water, and not only splash in it, but squat right down in it until practically nothing but their heads are sticking out. Sometimes when it is almost dark, and the last red tinge of afterglow is reflected in the tiny pool, a couple of dark spots on the shining surface tell just where two little song sparrows are cooling off for the night.

We have been altogether too busy to keep close watch on this bath but at different times we have observed the following birds using it: flicker, phœbe, Baltimore oriole, purple finch, white-winged crossbill, American goldfinch, vesper sparrow, white-throated sparrow, chipping sparrow, junco, song

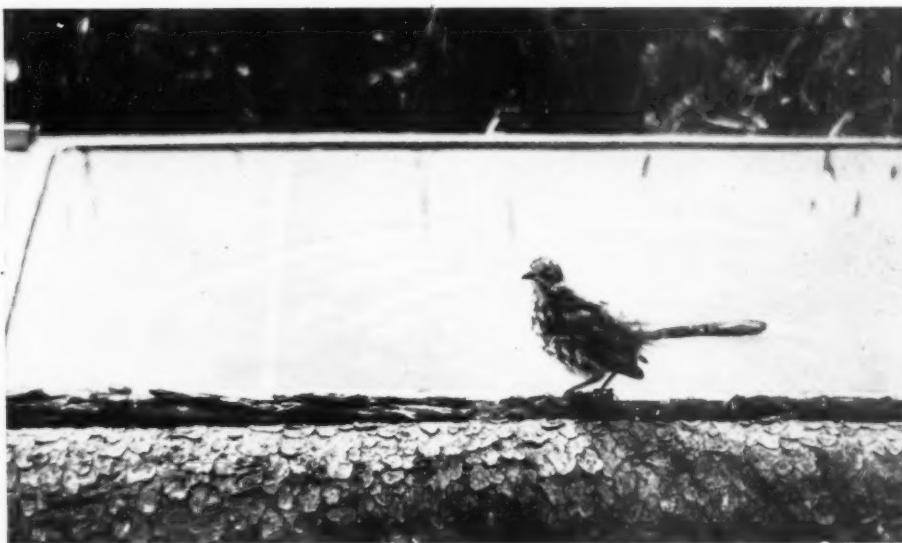
sparrow, chewink, cedar waxwing, black-and-white warbler, Nashville warbler, myrtle warbler, chestnut-sided warbler, catbird, brown thrasher, hermit thrush, robin and bluebird. Probably there have been many more which we have not observed.

The arrangement of steps, while interesting, is by no means necessary. A bath about three feet long, two feet wide and three inches deep, with a continuously sloping and roughened bottom, starting at one end half an inch from the top and ending at the other at its lowest point, would probably answer the purpose just as well. Speaking of the roughened bottom, reminds me that almost if not quite as important as the depth of water, is the character of the footing on the bottom. This should never be slippery, for birds lose confidence when they find they cannot keep their feet. A layer of coarse sand or fine pebbles will usually give the desired "footing" in a bird bath, and a slippery pan or dish can be rendered safe by placing in it a freshly-cut sod, having about half an inch of the grass submerged. This makes a wet spot such as many of the small birds are very fond of.

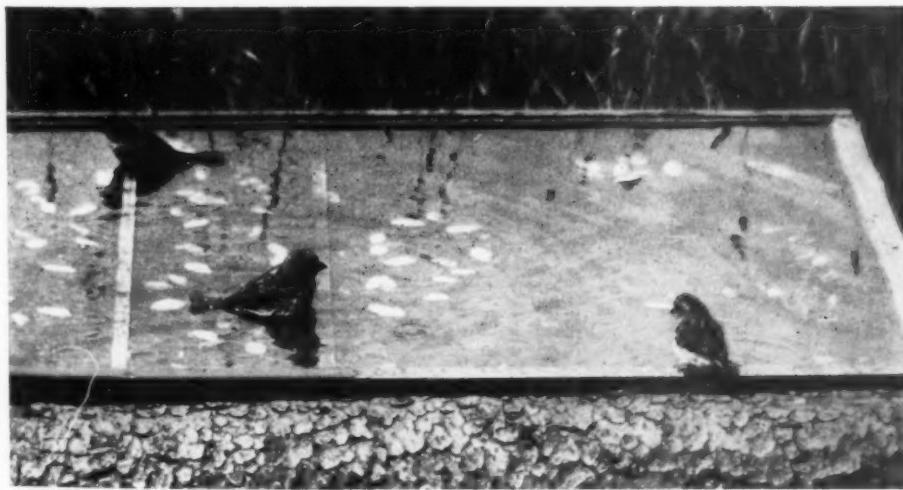
Concrete is very useful for the construction of pools for the comfort of birds; it may be used alone, as in the case of a bird bath in my own garden, or in connection with natural rock cropping out above the earth. The former was made as follows. I scooped out in the lawn an elliptical hollow, four feet by three feet six inches, the sides sloping down in all directions toward the center where the depth was four or five inches. I then took some Portland cement and some coarse sand and mixed the two, in the proportion of one of cement to four of sand, adding just enough water to give the consistency of common mortar.

Then with my hand, I plastered the surface of the hollow, putting in enough to make the depth at the center about two and a half inches. I was careful not to make the sides too smooth, although the concrete itself gives an excellent foothold for the birds. We have no running water in this; about once a week we sweep the water out with a stiff broom and put two pails of fresh water into it. It has been a complete success, and being within ten feet of the house we have had great pleasure in watching the birds from the windows and from the piazzas. We have seen six bluebirds — the parents and four young — bathing in it at once, and at other times there have been whole flocks of song sparrows, white-throated sparrows and juncos, in addition to the many birds that come in smaller numbers. With a few shrubs and hardy flowers planted about it, such a bath can be made a beautiful little feature in any garden. And of course there is no reason in the world why it should not be made much larger if one has plenty of room and the time to make it.

Dr. Ernest L. Huse, president of The Meriden Bird Club, has a somewhat similar bath in his garden, but he has carried the idea a little farther. In the center he has sunk a tub, and from the rim, which is perhaps two and a half inches below the surface of the ground, the concrete slants outward and upward in all directions, making shallows in which the birds will drink and bathe. In the tub, pond lilies are planted, and spread their leaves and blossoms over the surface. Round about, shrubs and tall grasses are planted, and here and there among them one catches a glimpse of little food trays, filled with hemp and millet which tend to keep the birds about the spot even when the bath is over. There is hardly a limit to what



Two and a half inches is about the proper depth of water for a bird bath, with five inches the maximum for blue jays and grackles. A successful bath may be provided with an arrangement of steps under water, giving shallow spots for the bird's cautious entrance and deeper places for his later delight



From a hearty meal at the food tray birds may fly directly to the bird bath, entering the shallowest water first, then sousing themselves thoroughly in the deepest part — with no respect for theories regarding a bath too soon after dinner



Such a pool at dusk may emit a flying spray from the wet plumage of bathing bluebirds and song sparrows, while an exclusive phoebe is waiting on a branch above for a chance to cool off for the night by a few dashes through the water. A concrete pool with flowers planted about it, may be made an attractive feature of any garden

may be done with concrete in this way, especially if it is used in connection with beautiful stones, pebbles, sand and shells.

Of course in the case of bird baths which are not raised well above the ground, great care must be taken that the little bathers are not pounced upon by cats, which would otherwise have the songsters at an unusual disadvantage. In the first place the birds are so engrossed with the joy of the bath that they are less wary than usual, and their feathers being wet they fly slowly and heavily, often close to the ground. If we cannot be sure about cats, we must either have the bath raised well above the ground on some object which a cat cannot climb, or else we must be content with a very plain bath out in the open, without

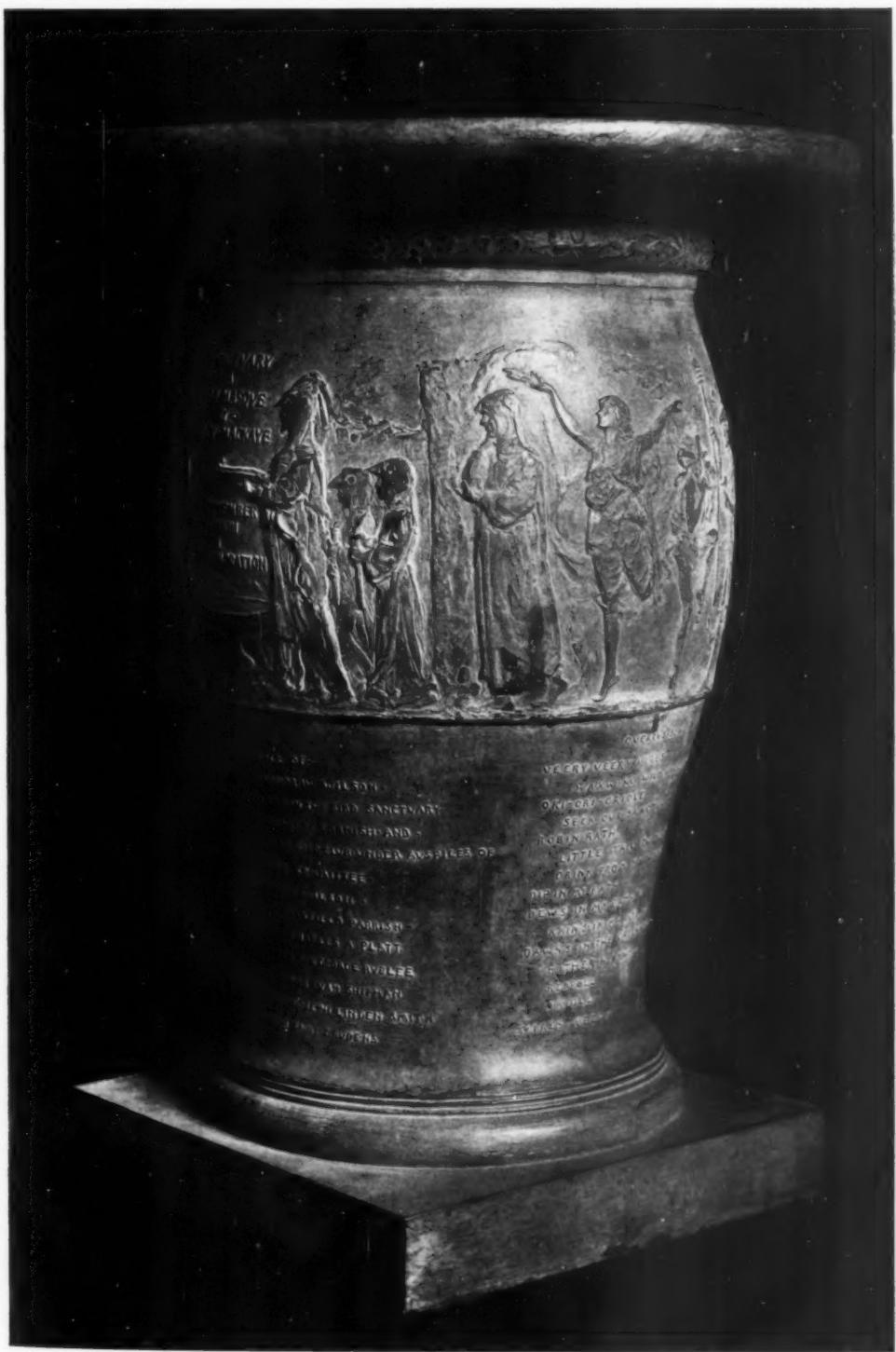
may have similar baths in view, I will say that several teams of oxen were required to move it, and that to haul it, set it on a good foundation of stones,



A bird bath in the Bird Sanctuary at Meriden, New Hampshire, is made in the natural hollow of a split granite boulder. The boulder has been placed upon a stone foundation and fitted with a pipe leading upward through a hole drilled in the boulder to give a continual supply of fresh water

shrubs or grass about it, for behind such things a cat will crouch.

I have spoken of a bird bath made of a granite boulder; we have two like this in Meriden, New Hampshire, and they are among the most satisfactory baths we have. The one in the Meriden Bird Club's sanctuary, estimated to weigh five tons, was lying where the glacier left it on a hillside rather more than a mile away. For the benefit of those who



BRONZE BIRD FOUNTAIN

Executed by Mrs. Louis Saint Gaudens for the Bird Sanctuary at Meriden

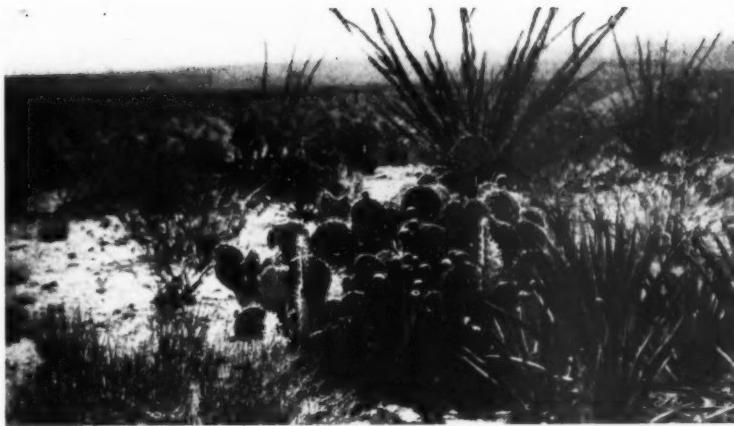
and drill a hole through it for the water pipe, cost forty dollars. It is a beautiful object, very suitable for its purpose and will last forever. It was presented to the Club by a Boston lady who desired to establish a bird fountain in memory of her friend, Dr. Edward Everett Hale, himself a lover of birds. I often think how much more appropriate as a memorial to a real man or woman is a beautiful thing like this, made by Nature, carved by her mighty forces, and dedicated to the use and enjoyment of the loveliest of her children, than is a shining, ugly and utterly useless polished shaft, whose chief recommendation is that it costs from a hundred to a thousand times as much.

The lovely bronze fountain executed by Mrs. Louis Saint Gaudens, is another of the charming features of the Bird Sanctuary at Meriden, and makes one realize that with the sculptor as an assistant there is no end to the artistic bird baths which may be designed. This particular bath was made in commemoration of the first presentation of Percy MacKaye's Bird Masque, *Sanctuary*, and was presented to the Meriden Bird Club by a New York lady who

witnessed the play. It will be seen by the shallowness of the basin at the top that my remarks about the depth of the water apply just as much to a formal work of art as to a granite boulder or an earthenware saucer. The rule about surface also applies, and the sculptress purposely left the surface of the inside of the basin slightly rough that the feet of the little bathers might not slip. Below the shallow bowl and in bas-relief may be seen in procession the principal characters who took part in the masque. Below these are interesting inscriptions, some of them historical, others consisting of quotations from the masque itself. Of these the one that sends the reader away filled with determination to do something for the cause of bird conservation is the compact proposed by the poet to the converted plume-hunter and the naturalist: —

A compact, then, that when we go
Forth from these gracious trees
Into the world, we go as witnesses
Before the men who make our country's laws,
And by our witness show
In burning words
The meaning of these sylvan mysteries:
Freedom and sanctuary for the birds!





In the country of the Apache Indian

MOTION PICTURE RECORDS OF INDIANS FILMS THAT SHOW THE COMMON INDUSTRIES OF THE APACHE

By Pliny E. Goddard

THE ethnologist is not primarily concerned with the actual objects displayed in a museum. The true subject matter of ethnology is made up of the habitual movements and activities of a people. An Indian on horseback does not differ in general appearance from a white man in that position, but the fact that an Indian mounts from one side and a white man from the other constitutes an important fact in ethnology. It is one of the small habits which in their combined effect make the difference between a white man and an Indian. Such habits are the most important means of making comparative and historical studies in ethnology, for they are generally learned from one's neighbors or ancestors. Through them, therefore, one may trace the distribution of habits and customs geographically or historically.

In the past, such habits have been studied by observing the daily life of a people and reducing such observations

to writing, using drawings and photographs as illustrations. It is tolerably difficult to observe and record every significant movement involved in the work of a single individual engaged in such a simple task as making a flint arrowhead. When several individuals are engaged in the same undertaking, it becomes impossible for a single observer to follow the movements of each worker.

The moving-picture camera furnishes an excellent method of making a permanent record of the movements of one or, if properly localized, of several people. This record can be scrutinized in detail for as long a time as is desired and can be viewed repeatedly. It records many things which otherwise would not be made objective, such as the characteristic nervous coöordinations and movements of different people. To make such records of value, great pains must be taken not to arouse self-consciousness in the subjects being photographed. Such unavoidable self-consciousness as



1 — Posture assumed and position of the hands in discharging an arrow

2 — From the film the movement of the hands in basket-making can be observed

3 — Liquid pitch is being applied to a basket to render it watertight

arises when one first faces a camera disappears as the persons become interested in the work or ceremony.

It would require a very long time to secure a record of the various industries of a tribe if these were all taken as they were actually performed as a matter of yearly routine. In practice, it is necessary to have these duties undertaken for the special purpose of photographing them. When this is done, however, it is usually possible to allow the subjects to assume their own poses and positions even if the result is less attractive in arrangement. The photographer needs only to insist on a proper relation to the source of the light. To take the entire action of a piece of work lasting for several hours, such as the preparation of the pitch and its application to a water basket, involves too great an expense and more film than can be utilized. In such cases it is necessary to have the camera constantly in position, and to operate it only when movements of significance occur. It is seldom necessary to change its position for simple industrial acts.

During a field trip to the San Carlos Apache this year a small daylight loading camera was employed. Films were made of such industries as basket-making, the boiling and applica-

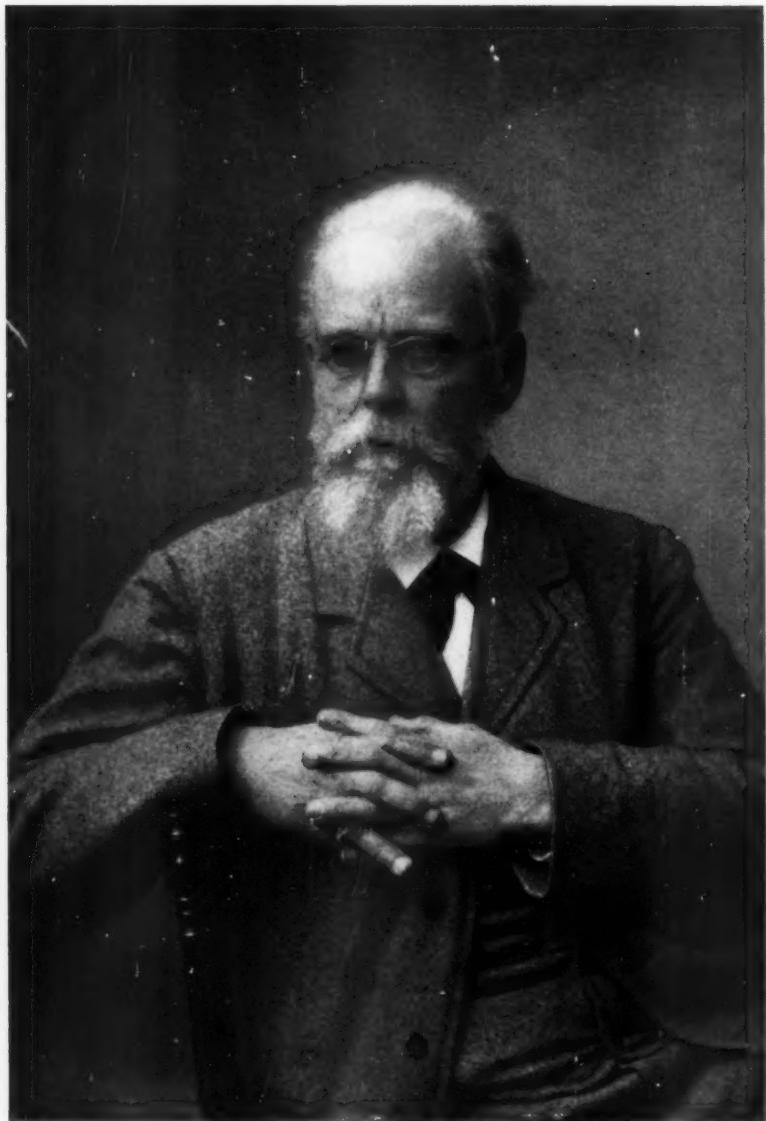
tion of pitch to make a basket watertight, the gathering of mesquite beans, the grinding of corn, the preparation and cooking of the century-plant stump. Men were photographed flaking arrowheads, feathering arrows, and putting sinew on a bow. The rather simple process of discharging an arrow from a bow, taken on twenty-five feet of film, illustrates the position of holding the bow and the arrow release practised by the Apache, two points of considerable comparative interest. It was not possible to secure films of religious ceremonies because of the superstitious attitude of the Indians. Films of a gambling game in progress and of two old men taking a sweat bath were secured.

Considering the results obtained, the method is not excessively expensive. It ought to be applied system-

atically and energetically in North America, while there are Indians still living who have habitually performed these native industrial acts. After the disappearance of primitive life, films of this sort will be invaluable.



1 — Apache women shelling acorns and grinding and shelling corn
2 — Gathering mesquite beans, the pods only of which are edible
[Still pictures taken in connection with motion films]



AUGUST WEISMANN, ZOOLOGIST, 1834-1914

A follower and supporter of Darwin, whose work played an important part in the development of the theory of heredity

AUGUST WEISMANN

Born January 17, 1834, died November 5, 1914

By Frank R. Lillie

Professor of Zoölogy at the University of Chicago

THE life of Professor Weismann spanned the most interesting and important period in the history of biology. In his early childhood Schleiden and Schwann established the cell theory (1838–1839); he was a young man of twenty-five at the time of publication of Darwin's *Origin of Species* (1859). During his active life as zoölogist were discovered those great principles concerning cell-division, the fertilization of the egg and the history of the germ-cells, which he applied with such success to the theory of heredity. He participated in the grand struggle over the evolution theory and the factors of evolution during the latter half of the nineteenth century; he witnessed the rise of experimental zoölogy and in his old age came the period of exact research in genetics, which his own studies had done much to prepare.

The last weeks of his life were saddened by the great war. He had lived a long life full of loving and disinterested labor, crowned by many honors and the universal respect of the scientific world. An immense pathos inheres in his last public act — the relinquishment of the academic honors bestowed on him in England.

Like so many of the zoölogists of his time Weismann studied medicine, but he found opportunity during the short period of its practice to carry out zoölogical investigations on the life history and especially the post-embryonic development and metamorphosis of flies. In 1863 he became attached to the University of Freiburg, and spent the re-

mainder of his life, fifty-one years, in this quiet provincial University, in spite of offers from larger universities. Here he found the leisure and the quiet beautiful surroundings in which he could devote himself heart and soul to investigation and reflection. His objective investigations were limited by serious trouble with his eyes which began in the seventies, and later compelled him to relinquish the microscopical studies for which he had such unbounded enthusiasm. His vision was thus turned more and more inward to constructive thinking; it was no doubt in part due to this physical handicap that we owe his great theoretical generalizations.

Weismann was a true naturalist, who viewed nature with a loving enthusiasm which appears clearly in the objective researches in zoölogy of the first fifty years of his life. His main contributions are classical in their mastery of detail, wealth of observation and broad outlook. His earliest studies were physiological and histological (1858–1862). Then followed a series of papers on the embryonic and post-embryonic development of flies (1862–1866). Studies on the seasonal dimorphism of butterflies next engaged his attention in which he raised questions that led to later fundamental researches by other investigators. In 1875 he began a long series of studies on the natural history and reproductions of Daphnids (continued to 1889) which constitute the foundation of all subsequent study on this group and were especially important for the fundamental problems of parthenogenesis, sex-

determination, and significance of the polar bodies. Between 1880 and 1883 he was engaged in his epoch-making researches on the germ-cells of hydroids which uncovered the fundamental facts on which his theory of the continuity of the germ-plasm was based.

The special papers and memoirs dealing with these and other investigations constitute a great body of knowledge to which zoologists will constantly refer as the foundation of many important lines of research.

About 1884 he was forced to turn from such investigations, owing to increasing eye troubles. From this time date those contributions to the theory of evolution and heredity for which he is best known to the general educated public, as one of the greatest of Darwin's successors. These were however by no means his first publications on these subjects, for in 1868 he had published a "Justification of the Darwinian Theory," in 1873 a study of the influence of isolation in the origin of species, and a volume of studies on the theory of descent, later translated into English.

His best-known contributions on these subjects began with a series of essays published between 1881 and 1891 on the "Duration of Life" (1881), on "Heredity" (1883), "Life and Death" (1883), "The Continuity of the Germ-plasm as the Foundation of a Theory of Heredity" (1885), "The Significance of Sexual Reproduction in the Theory of Natural Selection" (1886), etc., etc., all of which led up to and culminated in his volume on *The Germ-plasm* (1892). In 1896 his *Germinal Selections* appeared. In 1902 all of his theoretical considerations were brought together in two volumes on, *The Evolution Theory*, translated by Professor and Mrs. J. Arthur Thompson in 1904.

It is impossible to discuss in any fullness the theories of these publications.

All centered around his conception of the continuity of the germ-plasm, and of heredity as developmental recapitulation; thus the denial of the prevalent belief in the inheritance of acquired characters was a necessary corollary of this conception of inheritance. Weismann maintained not only that the inheritance of variations and mutilations of somatic origin was theoretically impossible, but he labored to show that it was by no means a necessary support of the evolution theory, as had been generally assumed. He met with greatest skill and keenest logic the many attacks which followed the statement of his position; his controversy with Herbert Spencer on this subject between 1893 and 1895 constituted the most notable of these debates. In the end he completely won over the great majority of naturalists to his way of thinking, and freed the theory of evolution and heredity from an enormous incubus.

In his theory of the continuity of the germ-plasm, Weismann formulated a point of view on which all subsequent genetic research must be based. He recognized with Darwin that a theory of evolution must find its final analysis in the life history of the individual, which contains the key to heredity and variation. Darwin's theory of pangenesis, constructed as a formal hypothesis of heredity and variation, involved unnecessary and untenable conceptions; he had assumed that each cell of the body produced, at all stages of its life, living particles (gemmales) capable of reproducing the parent cells. These particles were cast off from the parent cells and accumulated in the germ-cells, each of which was supposed to contain a complete assortment arranged in a definite fashion. The development from the germ-cell depended on the successive liberation and development of these

particles into cells like those from which they originally arose. The inheritance of acquired characters could thus be explained on the assumption that modified cells produced modified gemmules which reproduced the acquired modification in the succeeding generation.

Weismann rejected the centripetal part of the Darwinian theory, while still retaining certain fundamental conceptions of pangenesis. The theory of the continuity of the germ-plasm however offers a complete antithesis to Darwin's theory in the sense that, whereas Darwin regarded the germ-cells as a secretion of the entire body, Weismann regarded them as genetically distinct from all the remainder of the body or soma — as producing the soma but not produced by it. In the production of the soma not all of the active protoplasm (germ-plasm) of the original germ-cell was used up; but a certain amount of it was retained unmodified and formed the germ-cells of the new generation. Thus the germ cells of any one generation were regarded as a direct unmodified product of the germ-cells of the parents, and so were handed down from generation to generation, essentially uninfluenced by the soma, retaining their original attributes and developmental capacities unchanged. This conception constituted an immense simplification of the Darwinian scheme.

However, Weismann accomplished much more. Darwin's theory had been a purely imaginative construction and was frankly acknowledged by himself to be a formal hypothesis. Weismann's theory on the other hand was based on the newly discovered facts concerning cell division, the fertilization of the egg and the processes involved in the origin of germ-cells. As a theory of heredity it has precisely the same relation to Darwin's theory of pangenesis that the latter's theory of natural selection had

borne to preceding evolution theories. It permitted test and verification and involved predictions which have been verified in certain cases, the most crucial test of any theory.

The studies of cell-division carried out by Fleming, Hertwig and others had revealed a precise set of phenomena in nuclear division common to animals and plants, which suggested (Roux) a fundamental rôle of the nuclear elements or chromosomes in the cell life. Similarly the studies of Hertwig, Strasburger, Fol, and Van Beneden on fertilization had shown the predominantly significant part played in the process by the nucleus and its chromosomes; and the beginnings of knowledge, destined soon to be carried very much farther, concerning the maturation phenomena of the germ-cells, had demonstrated a similar predominance of significance of the chromosomes in these processes. Weismann used all of these data first in the identification of the chromosomes as the really significant part of the germ-cells (germ-plasm), and second in the construction of a detailed theory on this basis. He was thus able to predict as a logical necessity, the occurrence at some stage in the life history of a reduction division of the nuclei of the germ-cells which would halve the number of chromosomes instead of maintaining the whole number as in all of the other divisions. This prediction has been universally realized in plants and animals. The phenomenon was later found to parallel exactly the Mendelian laws of inheritance and to furnish their explanation to a considerable extent. There are few instances in the history of science, outside of astronomy, in which prediction has been so adequately and significantly fulfilled.

The fundamental assumption of the theory of continuity of the germ-plasm involved corollaries of the most signifi-

cant kind. If the germ-plasm is at all times distinct from the soma, then definite characters acquired by the individual in the course of its lifetime must perish with the individual. There was no known or conceivable mechanism by which such characters could be transferred to the germ-cells and thus carried over to a succeeding generation. Weismann at once recognized this, and began that attack on the belief in the inheritance of acquired characters which furnished the sharpest post-Darwinian debate of the nineteenth century. Weismann argued in the following ways: (1) Such inheritance is theoretically inconceivable; this argument was developed in so thorough a fashion as to be regarded by many as conclusive in itself. (2) The data usually cited to support the case of the inheritance of acquired characters were shown to be so uncritical as not to bear examination, in some cases as to the facts themselves and in others as to their interpretation. Under the latter head the supposed inheritance of diseased conditions, as inferred at that time, was shown to be equally explicable on the assumption of inheritance of germinal weakness. (3) Weismann carried out detailed critical experiments to investigate the commonly accepted idea of inheritance of mutilations; for many generations he amputated the tails of white mice and found by measurement that the tails came as long at the end as at the beginning. (4) He argued successfully against the contention that inheritance of acquired characters is necessary to explain evolution.

If heritable variations do not arise by use or disuse of parts or by action of incident external forces upon the organism, it is necessary to explain how they come about. Weismann put forward three ideas which contain the germ of our modern working hypotheses, viz. (1)

the theory of germinal selection; (2) the results of amphimixis; and (3) direct action of environment on the germ.

The theory of germinal selection involves the postulated architecture of the germ-plasm, which was conceived as composed of a great number of elementary particles (determinants), each the representative of some unit-character of the organism. Weismann reasoned in general that conditions in the germ-plasm must be conceived as variable, and thus more or less favorable for the growth of these elements; favored ones would tend to increase, those in unfavorable positions to decrease. The conception of the struggle for existence was transferred to the germ-plasm and variation-producing modifications of the germ-plasm were attributed thereto. This theory, by which Weismann himself laid great store, has been sterile; it was purely formal and has had no effect on research.

The second hypothesis concerning the effects of amphimixis, or admixture of parental germ-plasms in fertilization, was by no means original with Weismann; but he was the first one adequately to prove its significance and to show how the admixture of different sets of parental characteristics, their shuffling in the filial germ-plasm and redistribution in the half reduction divisions of the filial germ-cells is a constant, and perhaps the greatest, source of heritable variations. However, he did not proceed quite to the extreme of the past president of the British Association for the Advancement of Science, Professor Bateson, and postulate the possibility that evolution has been productive of nothing essentially new from its inception.

The third source of heritable variations postulated by Weismann, viz. the action of incident external forces

upon the germ-plasm directly was never adequately analyzed by him. He alludes to it in his earlier essays, without following the matter farther. It has required the detailed investigations of Tower and MacDougal especially to give this real meaning, and such studies are still in their infancy. However, it is important to recognize Weismann's foresight with reference to this.

It is no part of this review to point out the weaknesses of Weismann's theories, for this is not the place for an adequate critical review. However, we should be open to the charge at least of incompleteness if we failed to point out that Weismann's theories were based on the data of a purely morphological period of genetic research. The experimental studies which followed close on the heels of his fundamental publications swept away, probably irrecoverably, some of the elements of his conceptions. Genetic conceptions are coming to be more and more physiological; and it is a logical necessity that analysis should continue to proceed in this direction. Biologists generally have discarded the Weismannian notion of living independent entities (determiners) in the germ-plasm, representative of entire unit characters, and have replaced it by the conception

of differential (chemical) factors located in the germ-plasm and interacting with other factors (or chemical substances) in the cell. But when we effect such a change of conceptions, fundamental as it may be, we still deal to a considerable extent with those phenomena of the chromosomes whose significance Weismann did so much to make plain. Similarly we can no longer deal with the development of the individual in terms of qualitative nuclear analysis as Weismann did, for it has been proved that the cytoplasm has a predominant determining influence in many of the phenomena at least, and it has not been proved that nuclei in general grow qualitatively different. However, it must be realized that Weismann's precise formulation of his theory of individual development furnished the stimulus for some of the fundamental investigations that have made real advances in this difficult field.

I think it is fair to say that Weismann played as important a part in the development of a theory of heredity as Darwin did in the theory of evolution in general; he must, therefore, be regarded as among the greatest of Darwin's followers and supporters. The biological world must forever hold his memory in reverence.

MORGAN'S "HEREDITY AND SEX": A REVIEW

By E. G. Conklin

THIS book is the outgrowth of the Jesup Lectures for 1913 which were given by Professor Morgan at the American Museum of Natural History. It is a very difficult thing to make a book interesting to the general public and at the same time valuable to scientific readers, but this difficult task Dr. Morgan has accomplished in an admirable manner. His book is a work of extraordinary interest to the intelligent layman and at the same time one of great value to professional biologists, and its wide success is attested by the fact that the first edition was exhausted and a new one issued within a year.

The book embodies the results of a large amount of research work by Dr. Morgan and his pupils as well as by many other investigators. The subjects dealt with in the eight chapters are: Evolution and Sex; The Mechanism of Sex Determination; The Mendelian Principles of Heredity and their Bearing on Sex; Secondary Sexual Characters and their Relation to Darwin's Theory of Sexual Selection; The Effects of Castration and Transplantation on the Secondary Sexual Characters; Gynandromorphism, Hermaphroditism, Parthenogenesis and Sex; Fertility, and Special Cases of Sex Inheritance. Each of these general topics is dealt with in a manner which is not only instructive but also illuminating and interesting. As to the "Evolution of Sex" it is shown that we know actually nothing about the manner in which sex has come to be. Sexual reproduction brings about many new combinations of characters but such recombinations do not furnish the materials for evolution as Weismann assumed. However these new combinations of ancestral characters produce a great amount of individual variation and this may be beneficial to a species in helping it to survive. Furthermore if a new character arises in a single individual it may be grafted on, as it were, to the species by sexual reproduction.

¹ HEREDITY AND SEX, by Thomas Hunt Morgan, Ph.D. Professor of Experimental Zoölogy in Columbia University, pp. ix + 292 with 121 illustrations in the text. Columbia University Press: New York, 1913. Revised Edition, 1914.

There is an interesting discussion of the various types of accessory organs of reproduction which serve to bring the spermatozoa and ova together and of the secondary sexual characters which distinguish males and females such as brilliant colors, instincts and behavior in courtship. "In man courtship may be an involved affair.... Nowhere in the animal kingdom do we find such a mighty display; and clothes as ornaments excel the most elaborate developments of secondary sexual characters of creatures lower in the scale."

With remarkable clearness and brevity the author presents the facts of the complicated structure of the germ-cells, their origin, maturation, union in fertilization, the way in which sex is determined and the mechanism of hereditary transmission. He accepts unreservedly the view that sex is determined at the time of fertilization; if the egg is fertilized by one type of spermatozoon a male is produced, if by the other type a female results. He also holds that the evidence is "almost convincing in favor of the view that the chromosomes are the essential bearers of the hereditary qualities." In favor of the chromosomal theory of heredity he presents evidences drawn from cytology, from experiment and from *sex-linked* inheritance. The latter is a type of inheritance, first clearly distinguished by Morgan, in which characters are transmitted to male or female offspring in exactly the way in which certain chromosomes are transmitted. On the other hand in *sex-limited* inheritance "the secondary sexual characters appear in one sex only and are not transferable to the other sex without an operation."

After discussing the principles of inheritance discovered by Mendel the author presents the results of his own work on the inheritance of sex-linked characters in the fruit fly. This is perhaps the most important part of this book, as it is one of the most valuable contributions to the study of heredity which has been made in recent years. The author concludes "that when inheritance factors lie in different chromosomes they freely assort and give the Mendelian expectation; but when they lie in the same chromo-

some they may be said to be linked and they give departures from the Mendelian ratios." Inasmuch as factors which usually lie in different chromosomes may sometimes come to lie in the same chromosome, Morgan has suggested that when the maternal and paternal chromosomes pair in the maturation stages of the egg or spermatozoon, the chromosomes of each pair may actually fuse at certain points where they cross each other and thus portions of the chromosomes with their factors exchange places. With this interesting hypothesis as a basis he has been able by means of his breeding experiments with fruit flies to plot the location of particular inheritance factors in individual chromosomes. This work, although in many respects hypothetical, is well supported by evidence and it is probably the most important work ever done on the "architecture of the germ-plasm."

A large number of cases are presented in which the sexes differ in color, form or habit and the inadequacy of Darwin's theory of sexual selection to account for these secondary sexual characters is generally admitted. Similarly it is shown that the selection of continuous variations, or of what might better be called non-inherited variations, is of no evolutionary significance. Even in the case of discontinuous or hereditary variations the author shows that natural selection plays no part in the *formation* of these variations.

The effects on secondary sexual characters

of the removal and of the transplantation of ovaries or testes are described in the fifth chapter and the conclusion is reached that "the secondary sexual characters in four great groups, *viz.*, mammals, birds, crustacea and insects are not on the same footing."

Those interesting cases in which both sexes are united in the same individual or in which eggs develop without being fertilized are treated at some length in the sixth chapter, and here as everywhere else Morgan draws to a large extent upon his own researches.

In the chapter on fertility and sterility many scattered and diverse observations are summarized, though the facts cannot at present be satisfactorily generalized or explained. The last chapter deals with special cases of sex-inheritance, such as sex in bees, peculiar forms of sex-linked inheritance in fruit flies, and the sex ratios in birds, frogs and man.

This book was written on the firing lines, as it were, of biological science and it deals with many matters which are not finally settled. It is inevitable that such a book should encounter differences of opinion on the part of other investigators in this field, but the author is peculiarly happy in his manner of presentation. He writes as one who is convinced and yet tolerant and open-minded. His style is brief, keen, attractive, and best of all in a scientific work he shows a thorough, first-hand acquaintance with the phenomena described, and sound judgment and good imagination in dealing with them.

NOTE ON THE CROCKER LAND EXPEDITION SHIP

By George H. Sherwood

Acting Chairman of the Committee in Charge

THE Committee in Charge of the Crocker Land Expedition announces that it has chartered the "George B. Cluett" for the purpose of transporting to New York the members of the expedition party which went north in 1913 on the chartered ship "Diana." The "Cluett" is a three masted auxiliary schooner owned by the Grenfell Association and used by it for carrying hospital and food supplies from St. Johns, Newfoundland, to the various mission stations along the coast of Labrador. The "Cluett" was launched on July 1, 1911, and

is one hundred and thirty-five feet over all. She is well built and heavily timbered and is to be "fortified" as a further protection against the ice before starting on her journey northward.

The "Cluett" will leave Battle Harbor about the first week in July, go directly to Etah, there taking on board the members of the expedition party, their collections and equipment, and will return to New York some time during September. Captain George Comer of East Haddam, Connecticut, has been engaged by the Committee to serve as ice

pilot and as a Museum representative on the ship. Captain Comer has had many years' experience in the ice fields of Hudson Bay and the Committee has the utmost confidence in his ability to guide the ship safely through the ice of Baffin Bay, land at Etah and start on the homeward journey before the winter ice begins to form.

The Crocker Land Expedition, as will be remembered, was organized under the auspices of the American Museum of Natural History and the American Geographical Society with the coöperation of the University of Illinois. Its staff, consisting of Donald B. MacMillan, leader and ethnologist; Fitzhugh Green, U. S. N., engineer and physicist; W. Elmer Ekblaw, geologist and botanist; Maurice C. Tanquary, zoölogist; Harrison J. Hunt, surgeon; Jerome Lee Allen, wireless operator; and Jonathan Small, mechanic, has been in the Arctic for nearly two years. The party sailed from the Brooklyn Navy Yard on July 2, 1913, in the "Diana" and stopped at Boston and Sydney, Nova Scotia, for additional supplies. After leaving Sydney, however, much ice was encountered in the Strait of Belle Isle and in a dense fog on the morning of July 17, the ship went fast aground on Barge Point, Labrador. The "Diana" was finally pulled off the rocks and returned to St. Johns where the equipment and supplies

were transferred to the "Erik" in which vessel the party safely continued its northward trip. It was found necessary to make the headquarters at Etah, North Greenland, instead of on Ellesmere Land as originally planned and it was there that the party spent the long Arctic nights of the winter of 1913-14.

In November of last year the Museum, through the kindness of Mr. Knud Rasmussen, the Danish explorer, received word that Mr. MacMillan accompanied by Ensign Green had made the one hundred and twenty-five mile dash northwest from Cape Thomas Hubbard across the ice of the Polar Sea in search for Crocker Land but that they had found that Crocker Land did not exist, at least within the range originally ascribed to it.

According to the original plans, the expedition is exploring and mapping the Greenland ice cap this spring and will later return to headquarters at Etah to await the coming of the ship chartered for the return to New York.

The Committee begs to call the attention of the friends of the expedition to the urgent need that exists for additional funds to help defray the cost of sending this relief ship northward. The unfortunate wrecking of the "Diana" with its incident expenses has been a heavy burden and additional subscriptions are earnestly desired.

MUSEUM NOTES

THE frontispiece of this issue of the JOURNAL is a photograph of the marble bust of John Burroughs, naturalist and author, made by Mr. C. S. Pietro and presented to the Museum by Mr. Henry Ford. The bust has been put on exhibition at an appropriate season — April, the month of reawakening nature and return of the birds — and in an appropriate part of the Museum, the local bird hall. April 3, the anniversary of the birth of John Burroughs, has been made a national "bird day" in Utah and was celebrated as a bird day for 1915 in New York and various other states.

A bird day bulletin to the New York public schools, decorated with a portrait of the great horned owl in color by Louis Agassiz Fuertes was sent out March 25 from the State Education Department of the University of the State of New York. The bulletin was

prepared by the three authors of the State Museum memoir, *Birds of New York*, and is endorsed by Dr. John H. Finley in the following words, "If these suggestions are generally followed, the State will be made richer by many millions and a great source of human happiness will be kept at our doors."

MR. JAMES P. CHAPIN of the Museum's Congo Expedition, after a six years' absence in Africa, arrived in New York March 30 by way of England. He brings the details of the wonderful success of the expedition, not only in the work of a scientific survey but also in having lived without mishap for the extended period of six years amidst the dangers of the equatorial forest and among the negro races of Central Africa — a success due in part to the cordial coöperation of the Belgian government. Mr. Chapin brings with him

about one-fourth of the expedition's collections. The balance remains in the hands of Mr. Lang, leader of the expedition, who also will come out of the Congo immediately after the final work of packing and shipment is completed.

The entire collection numbers some 16,000 specimens of vertebrates alone, 6000 of which are birds and 5000 mammals. The specimens are accompanied by some 4000 pages of descriptive matter and 6000 photographs. It includes full material and careful studies for museum groups of the okapi, the giant eland and white rhinoceros, besides many specimens of lions, elephants, giraffes, buffaloes, bongos, situtungas, yellow-backed duikers, black forest pigs, giant manis and chimpanzees.

The ethnological section of the collection is rich in specimens of native art of the Congo including several hundred objects of carved ivory, a revelation as to the capacities of the Congo uneducated negro. There are also seventy plaster casts of native faces from the Logo, Azande, Avungura, Mangbetu, Bangba, Anadi, Abarambo, Mayoho, Mabudu, Medje, Mobali and Pygmy tribes. Each cast is supplemented by a series of photographic studies of the individual.

Mr. Chapin will take up again his zoological studies at Columbia University and will retain his connection with the American Museum as assistant in ornithology. In this position he will work up for publication the 6000 Congo birds of the new collection which in point of preservation as well as size and number of specimens new to the American Museum, surpasses any collection that has ever been secured by the institution.

THERE is on exhibition in the west assembly hall for the month of April a series of photographic transparencies illustrating certain noteworthy features of the work of Professor Percival Lowell and his staff at the Observatory, Flagstaff, Arizona. The series shows, first, the Observatory, the great 24-inch telescope, and following, the spectra of the Moon, Jupiter and other planets. Of special interest are the photographs showing various aspects of Mars, including the much discussed "canal system." These are supplemented by drawings by Professor Lowell which illustrate the vegetation on Mars and the condition of the snow-caps at the north and south poles. Perhaps the most striking of the series is the large photograph of

Halley's Comet, which includes not only the comet itself, but the stars drawn into lines on account of following the comet with the camera, the planet Venus, and lastly a meteor which chanced to pass directly across the plate during the exposure.

Photographs of the Moon show the craters and the shadows of the great crater walls which rise almost vertically 10,000 to 15,000 feet. As the transparencies are brilliantly illuminated in a darkened room, it gives the effect of looking at the sky itself.

"ORIGIN and Meaning of some Fundamental Earth Structures" was the subject recently discussed by Professor Charles P. Berkey of Columbia University in the Jesup lectures for 1915. The course consisted of eight lectures and opened with a discussion of the origin and nature of the earth. The nebular and meteoric hypotheses of the origin of the earth were contrasted with the later and now widely accepted view that the earth has been built up by the slow accretion of planetesimals, or fragments of a disrupted sun that was the parent of the whole solar system.

Reasons for the existence of elevated areas and basin-like depressions, namely of the continents and oceans, were discussed; these elevations and depressions and the movements of the earth's crust were all traced back to gravitational forces, which were manifested in earthquakes, volcanic eruptions, mountain-forming uplifts, and submergences, all due eventually to the balancing of continents and oceans against each other (isostasy). The place and work of volcanic activity and the agencies and forces involved in the metamorphosis of rocks were treated, with constant reference to rock structure and to the cycles of transformation from sedimentary to metamorphic and igneous structures and the reverse. All this was finally applied to the interpretation of local geology and to such practical matters as foundation work, tunneling work, water supply and the qualities of structural material.

The Jesup lectures, which are Columbia University lectures given in coöperation with the American Museum, form an important medium for the presentation in concise form of scientific progress. The first course of the series was given by Professor Henry Fairfield Osborn in 1907, his subject being the "Evolution of the Horse." In the second series (1909) Professor Richard C.

MacLaurin presented "Newton's Experiments and Contributions to Optical Theory." In 1911 Professor Frederic S. Lee lectured on "Scientific Features of Modern Medicine," and in 1913, Professor T. H. Morgan summarized recent advances in the study of "Heredity and Sex." The Jesup lectures are being published by the Columbia University Press.

SINCE the last issue of the JOURNAL the following persons have become members of the Museum:

Annual Members. MRS. FREDERIC N. GODDARD, MRS. EVERARD B. HOPWOOD, MRS. C. D. JACKSON, MRS. SAMUEL W. WEISS, THE MISSES LEILA S. FRISSELL, MARGARET W. WATSON, HIS EXCELLENCY, IRA NELSON MORRIS, DR. HERMANN FISCHER AND MESSRS. LATHROP BROWN, G. E. CHAPIN, J. WARREN CUTLER, ALBERT DE ROODE, SAMUEL JACKSON, ROBERT E. NOLKER, EMIL T. PALMENBERG, FRANK H. PARSONS, WILLARD SCUDDER AND F. B. WIBORG.

"Men of the Old Stone Age" was the topic at the April 12th meeting of the Academy of Sciences. Professor Henry Fairfield Osborn presented some of the chief results of his synthetic work on this subject and made special acknowledgments of the coöperation of the following archaeologists, anatomists and geologists: Messieurs l'Abbé Breuil, Cartailhac, Obermaier, MacCurdy, Nelson, MacGregor, Starr, Penck, Reeds. He exhibited a chart illustrating the successive advances and retreats of the glacial ice in Europe and the corresponding succession of mammalian faunas and races of man. Illustrations of the skeletal remains of the paleolithic races were then passed in review.

Professor J. Howard MacGregor then exhibited his remarkably lifelike and accurate series of busts of prehistoric men. He explained the methods adopted in building up corrected models of the skulls, from casts of the imperfect original specimens, and in restoring the flesh, from data secured by dissection of recent types. Dr. A. Hrdlička, formerly of this Museum and now of the National Museum, was present and took part in the discussion.

ADMIRAL PEARY'S Arctic ship, the "Roosevelt," has been sold and after it has been fitted with oil-burning machinery and other improvements, will be used by the Bureau of Fisheries in the Department of Commerce

and Labor in connection with the fisheries service in Alaskan waters. The "Roosevelt" was the ship used by Admiral Peary on the expeditions in which he reached the "farthest north" record in 1906 and the North Pole in 1909, and was built expressly for the purpose in the spring of 1905. It is to be remembered that April 6 marks the sixth anniversary of the discovery of the North Pole.

A LIFE-SIZE model of the beautiful Portuguese man-of-war (*Physalia arethusa*), a remarkable product of the glass-blower's and colorist's skill, has recently been installed in the Darwin hall. The Portuguese man-of-war is not a single animal as might be supposed from its appearance, but a colony of animals in which the phenomenon of division of labor is most strikingly exemplified. One of the individuals in the colony is specialized to act as a float. The other individuals are attached to it, pendant from the lower surface. Some of them have mouths and feed for the entire colony; others are sensory in function and have no mouths; still others are armed with rows of stinging cells and form the offensive and defensive members of the colony; and still others can neither feed nor fight but are the reproductive individuals. The colony as a whole, the "Portuguese man-of-war," floats on the surface of the sea, especially in warmer regions, but is often brought north upon the Gulf Stream and drifts in upon the New England coast. Certain of the individuals making up the colony, those armed with the most powerful stinging cells, extend as long retractile streamers into the depths of the sea, at times to a length of forty feet. These also act as a drag anchor and keep the head of the float to windward. The coloration of the animal is strikingly beautiful, varying from deep cerulean blue through deepest purple to brilliant carmine. In the West Indies it is often seen floating in large squadrons on the sea.

APROPOS of the ever-widening scope of the lecture work which is being carried on by the Museum's department of education, it is interesting to note that a course similar to the Museum's Saturday morning stories for the children of members was inaugurated this year in Cleveland, Ohio. Mr. George H. Sherwood gave the introductory lecture of the series which included lectures by Mr. R. W. Miner, Mr. R. C. Andrews, Mr. Ernest Harold Baynes and Mr. Albert H. Pratt.



MODEL OF THE PORTUGUESE MAN-OF-WAR

An animal, or more exactly speaking, a colony of animals, that floats at the surface of warm seas. The transparent "float," blue, purple and crimson tinted, sails before the wind, trailing long retractile filaments. Preparation of model by Mr. H. Müller, glass blower, and Mr. S. Shimotori, colorist, of the American Museum

Model on exhibition in the Darwin hall

THE Hopi Indian group in the Southwest Indian hall has been completed and is now open to the public for inspection. This group aims to present a unified complete picture of pueblo life as illustrated in the home and industrial life of the Hopi Indians. The foreground is the roof of a Hopi dwelling, which is the center of daily life for the Hopi home. Here are shown life-size characteristic figures of Hopi men and women at their respective occupations: the men spinning and weaving, the women making baskets and pottery. In the background is the village of Walpi, on the end of the first Hopi mesa, with the village of Sichumovi in the distance. The group was designed and executed by Howard McCormick, an artist already distinguished for his paintings of scenes of the Southwest, and the figures were modeled by Mahonri M. Young, who coöperated with Mr. McCormick in the planning of the group. It is the first anthropological group constructed by the Museum at all comparable to the bird groups for which the institution has become famous, and marks the turning point in the development of the anthropological exhibits.

An opening view of the Hopi group was given to friends of the Museum on April 8 and was preceded by an exhibit of motion pictures taken by Mr. McCormick illustrating many phases of Hopi life which are represented in the group.

WORD has been received from Mr. H. E. Anthony, who is making a collection of birds and mammals for the Museum in Panama, that on February 21, he reached the base of Mount Tacarcuna in eastern Panama where he is favorably situated for the projected explorations to Mount Tacarcuna.

EARLY in the spring of 1914 Lord William Percy of Northumberland, England, under the auspices of the American Museum, joined the revenue cutter "Bear" on an expedition to the coasts of Alaska and Siberia for the purpose of securing water birds and especially Fisher's eiderduck. While Lord Percy was still in Alaska the "Bear" chanced to take by wireless a message which gave the news of the war. Lord Percy, who is a reserve member of the Grenadier Guards, left the ship immediately, made arrangements for transportation to Seattle and arrived in New York about a month afterward, and from there sailed immediately to join his regiment

at the front. Since that time occasional letters with personal facts of the war have come to New York. He was in France for four months. At one time the English troops were stationed only one hundred yards from those of the Germans and as he expressed it, "For us the war consists of shelling and shooting at the Germans all day and all night and of being shot at and shelled by them. It is not a very attractive form of warfare." A short time ago Lord Percy's friends in the Museum learned that he had been wounded and had lain for several hours in a shell-hole before he received medical attention. We are glad to learn that his wound, although serious, will probably admit of an early recovery.

MODELS have recently been installed in the hall of public health illustrating how the mosquitoes which transmit diseases are controlled upon the Isthmus of Panama. One model is a street scene which shows a disinfecting squad at work destroying yellow fever in the houses where the disease has occurred. A second model illustrates the burning of grass and the oiling of ditches to destroy malaria mosquitoes in open country.

MR. LEO E. MILLER writes from South America that he has completed his work in Antioquia and on March 30 sailed from Barranquilla to Colon en route to Bolivia, where it is proposed to inaugurate a zoölogical survey similar to that which the Museum has conducted in Colombia for the past five years. Mr. Miller's collections amounting to two thousand birds and mammals have been received and make an exceedingly important addition to the Museum's Colombian collections.

THE Librarian would be glad to receive back numbers of the JOURNAL, even those of quite recent date, as they are frequently asked for by libraries and other institutions desiring to complete volumes.

THE government of Porto Rico has made the second annual appropriation of five thousand dollars for the continuance of the scientific survey of the island under the auspices of the New York Academy of Sciences in coöperation with the American Museum and other institutions. Several members of the Museum staff will be engaged in this work during the coming months.

The American Museum of Natural History

Seventy-seventh Street and Central Park West, New York City

Open free to the public on every day in the year.

The American Museum of Natural History was established in 1869 to promote the Natural Sciences and to diffuse a general knowledge of them among the people. It is dependent upon private subscriptions and the fees from members for procuring needed additions to the collections and for carrying on explorations in America and other parts of the world. The membership fees are,

Annual Members.....	\$ 10	Patrons.....	\$1,000
Sustaining Members (annually).....	25	Associate Benefactors.....	10,000
Life Members.....	100	Associate Founders.....	25,000
Fellows.....	500	Benefactors.....	50,000

Guides for Study of Exhibits are provided on request to members and teachers by the department of public education. Teachers wishing to bring classes should write or telephone the department for an appointment, specifying the collection to be studied. Lectures to classes may also be arranged for. In all cases the best results are obtained with small groups of children.

The Museum Library contains more than 60,000 volumes with a good working collection of publications issued by scientific institutions and societies in this country and abroad. The library is open to the public for reference daily — Sundays and holidays excepted — from 9 A. M. to 5 P. M.

The Technical Publications of the Museum comprise the *Memoirs*, *Bulletin* and *Anthropological Papers*, the *Memoirs* and *Bulletin* edited by J. A. Allen, the *Anthropological Papers* by Clark Wissler. These publications cover the field and laboratory researches of the institution.

The Popular Publications of the Museum comprise the *JOURNAL*, edited by Mary Cynthia Dickerson, the *Handbooks*, *Leaflets* and *General Guide*. The following list gives some of the popular publications; complete lists, of both technical and popular publications, may be obtained from the Librarian.

POPULAR PUBLICATIONS

HANDBOOKS

- NORTH AMERICAN INDIANS OF THE PLAINS. By Clark Wissler, Ph.D. *Paper*, 25 cents; *cloth*, 50 cents.
INDIANS OF THE SOUTHWEST. By Pliny Earle Goddard, Ph.D. *Paper*, 25 cents; *cloth*, 50 cents.
ANIMALS OF THE PAST. By Frederic A. Lucas, Sc.D. *Paper*, 35 cents.

ILLUSTRATED GUIDE LEAFLETS

- GENERAL GUIDE TO THE COLLECTIONS. New edition issued December, 1914. *Price*, 25 cents.
THE COLLECTION OF MINERALS. By Louis P. Gratacap, A.M. *Price*, 5 cents.
NORTH AMERICAN RUMINANTS. By J. A. Allen, Ph.D. *Price*, 10 cents.
THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH. By George H. Pepper. *Price*, 10 cents.
PRIMITIVE ART. *Price*, 15 cents.
THE BIRDS OF THE VICINITY OF NEW YORK CITY. By Frank M. Chapman, Sc.D. *Price*, 15 cents.
PERUVIAN MUMMIES. By Charles W. Mead. *Price*, 10 cents.
THE METEORITES IN THE FOYER OF THE AMERICAN MUSEUM OF NATURAL HISTORY. By Edmund Otis Hovey, Ph.D. *Price*, 10 cents.
THE HABITAT GROUPS OF NORTH AMERICAN BIRDS. By Frank M. Chapman, Sc.D. *Price*, 15 cents.

THE INDIANS OF MANHATTAN ISLAND AND VICINITY. By Alanson Skinner. *In preparation.*

THE STOKES PAINTINGS REPRESENTING GREENLAND ESKIMO. *Price*, 5 cents.

BRIEF HISTORY OF ANTARCTIC EXPLORATION. *Price*, 10 cents.

TREES AND FORESTRY. By Mary Cynthia Dickerson, B.S. *A new edition in course of preparation.*

THE PROTECTION OF RIVER AND HARBOR WATERS FROM MUNICIPAL WASTES. By Charles Edward Amory Winslow, M.S. *Price*, 10 cents.

PLANT FORMS IN WAX. By E. C. B. Fussett. *Price*, 10 cents.

THE EVOLUTION OF THE HORSE. By W. D. Matthew, Ph.D. *Price*, 20 cents.

REPRINTS

- THE GROUND SLOTH GROUP. By W. D. Matthew, Ph.D. *Price*, 5 cents.
METHODS AND RESULTS IN HERPETOLOGY. By Mary Cynthia Dickerson, B.S. *Price*, 5 cents.
THE WHARF PILE GROUP. By Roy W. Miner, A.B. *Price*, 5 cents.
THE SEA WORM GROUP. By Roy W. Miner, A.B. *Price*, 10 cents.
THE ANCESTRY OF THE EDENTATES. By W. D. Matthew, Ph.D. *Price*, 5 cents.



A red squirrel eagerly watching the toads from the stone wall behind the wild apple tree. He is fond of a taste of meat in the spring after his winter on nuts and seeds. (From the Toad Group in the American Museum)